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Does Mr. H. P. Brown Find Such Methods Necessary?

We have received the following communication from a responsible party at Rochester, N. Y., who also states that the mayor of that city endorses the refutation:

On page 35 of H. P. Brown's "Electric Distribution of Light, Heat and Power," he states that three men were killed by grounded pulsating current circuits in Rochester, N.Y. This statement is not true; there never has been anyone killed by a current of any kind in this city.

Yours respectfully,
"DYNAMO."

Rochester, N.Y., Aug. 12, 1889.

The Insurance Interests and Electric Lighting.

The following letters were received by the committee on insurance of the Electric Light Association too late to incorporate in Chairman Alexander's report:

The efforts of your association to reduce the hazard of electric light wires to a minimum will meet with hearty co-operation of the Iowa Union of Underwriters. Our organization is such that but few of our laws or rules are absolutely mandatory, so that I doubt if we can be of much benefit to your association, further than to lend it our influence and to request compliance with your rules. All of which would possibly be gladly granted if properly presented to our members. Personally I shall probably be glad to assist you in any way I can. Yours very truly,
H. N. WOOD,
Prest. Iowa Union of Underwriters.

New York, August 3.

Replying to your circular 1st May, marked "second communication," first of which I did not receive, this Association will most willingly assist and co-operate with any electric light association with a view of harmonizing the two interests and diminishing the fire hazard. We will gladly do anything to elevate the standard of employés engaged in electric light installation and material used. At present in Canada a rigid inspection is insisted on by the insurance companies and permits issued before lights can be used. Enclosed herewith certificate form, also by same mail I send copy of rules and regulations of the Association. Yours very truly,
ROBERT MCLEAN,
Secretary Canadian Fire Underwriters' Association.

Toronto, Aug. 3.

I am in receipt of your second circular communication of May 1st last with reference to the formation of electric exchanges in the western country in accordance with the views expressed in your circular letter.

Our association meets some time in the early part of next month. The correct date you will see published in the insurance journals within the next few weeks, when it may be well for one of your officers to appear before the Association and give a personal explanation of the workings of such an organization as you desire to establish and the benefits which would accrue to the underwriters.

The insurance companies are always ready to encourage anything looking to the reduction of the loss ratio, and, if the plan you propose seems feasible they, no doubt, will take favorable action on it.

Yours truly,
J. C. GRIFFITH,
Secretary Fire Underwriters' Association of the Northwest.

Milwaukee, August 3.

* * The committee of aldermen of Milwaukee, who have been investigating electric railways, return home filled with love for electricity, and pronounce the electric motor for street car purposes a great success.

Cooking by Electricity.

The Hotel Bernina at Samaden, Switzerland, has for some time been lighted by electricity, power being supplied from a waterfall. As during the day this power is not required for lighting, and is, therefore, run to waste, the proprietor of the hotel has hit upon the idea of utilizing the current for cooking when it is not required for lighting,

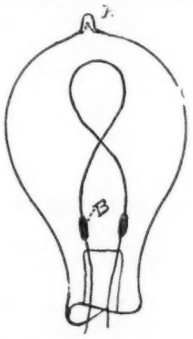

FIG. 2.

and an experimental cooking apparatus has been constructed. This contains German silver resistance coils, which are brought to a red heat by the current, and it has been found possible to perform all the ordinary cooking operations in a range fitted with a series of such coils.

Electric Weighing Machine.

Mr. William Snelgrove has invented an electric weighing machine which he has sent to the Paris exhibition. It is operated and controlled by the current of a small constant battery concealed in the base. The machine is of the knife-edge lever type, and is provided with three movable poises or slides.

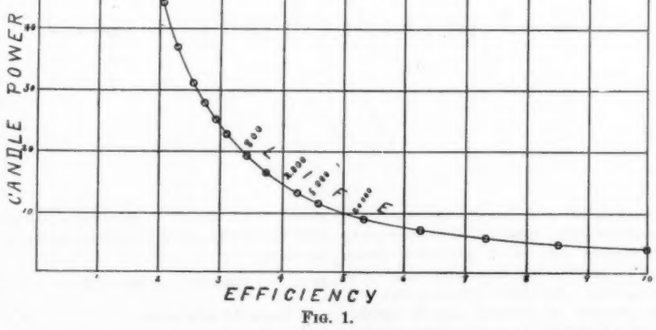

FIG. 1.

As the goods to be weighed are placed on the platform these poises automatically start and travel backward and forward on the steelyard until they exactly balance the goods; the correct weight is then shown by the machine in a single group of figures. When the goods are removed from the platform all the poises automatically return to zero, the last one breaking the battery circuit and preventing any waste of current.—*Elector Mechanic.*

Postage on Graphophone Cylinders.

The invention of the phonograph and graphophone having given rise to a rather knotty question concerning the proper classification as mail matter of the cylinders

FIG. 3.

used for the reproduction of the messages given forth by those instruments, the matter was referred to the Assistant Attorney-General for the post office department, who has decided that, being "personal communications," they are subject to postage at letter rates—two cents per ounce or fraction thereof.

* * One of the most convincing arguments in favor of using electricity for the propulsion of street cars is the fact that nearly every railroad which has operated electric cars upon a reliable system, for some time, has ordered additional number of cars. Among these railroads may be mentioned those at Wilkesbarre, Pa.; Wilmington, Del.; Richmond, Va.; Cleveland, O.; Reading, Pa.; Atlantic City, N. J.; St. Joseph, Mo., and a number of others. We understand that the street railroad which has been in operation upon the Sprague system in Akron, O., for about six months, and has been carrying large numbers of passengers, has lately ordered 20 additional motors for the equipment of its road.

The Daft system has been adopted by the Bloomington and Normal street railway, in the equipment of their 13-mile road with electric motors. The road is now operated by horse power.

Incandescent Lamps.

E. Z. BURNS, E.M.

The use of incandescent electric lamps is so extensive that a knowledge of the requirements which a good lamp should fulfill, as well as an knowledge of some of the methods of determining the excellence of the lamp, should be far more general than at present. It is a fact to be regretted that the purchaser in a majority of cases is mentally blindfolded by the agent in adopting any particular kind of lamp, and it is but fair to the agent to admit that the mental darkness is not always entirely on the part of the purchaser. This mutual condition of purchaser and agent arises largely in giving to the word "efficiency" a different meaning from that popularly understood. In other words, as pointed out by J. W. Howell in the *Electrical Engineer* for May, 1888, and also in the *Phil. Mag.* for April, 1885, an incandescent lamp of "high efficiency" may be a poor lamp, while a lamp of "low efficiency" may be a good lamp. This will be more apparent from a study of the curve shown in Fig. 1. In this lamp the candle-power was varied from 3.46 to 53 by a change of potential of about 25 volts, and it will be seen that it has an efficiency all the way from 10.3 up to 1.9. Nor is this all, for it will also be seen that while the life of the lamp at an efficiency of 5.1 is about 20,000 hours, it decreases very rapidly as the efficiency increases till, at an efficiency of 3, it has a life of only about 800 hours, and at 1.8 a life of only a few hours. Hence the excellence of a lamp is not expressed by the efficiency alone, but by the efficiency modified by the life. Then, too, as ordinarily employed, one is left in ignorance as to whether horizontal or spherical candle-power has been used in computing the efficiency. Since the electrical energy is dissipated in several ways, principally as heat and light, a true expression for the efficiency would be the ratio of the energy utilized in producing light to the the total energy expended in the lamp; so that the efficiency as ordinarily used leads not only to the misconception pointed out above, but is technically wrong.

In the following article it is proposed to discuss the characteristics of a few of the leading classes of lamps, together with the most important methods of examination to which they may be subjected to bring out their merits and demerits.

Taking for the basis of classification the filament, a division may be made as follows:

1st. Lamps, the filaments of which are derived from natural material, such as bamboo.

2d. Lamps, the filaments of which are derived from artificial material which is itself made up of fibrous material such as silk thread or paper.

3. Lamps, the filaments of which are derived from artificial material in a structureless condition, such as "Tamidine."

The base on which the glass bulb is mounted and the method of connecting the base with the socket are important factors in the value of a lamp. I will, however, state only a few general requirements which should be fulfilled in these parts. The base in all cases should be firmly cemented to the

bulb. Of course, this largely depends on the cementing material which should not only adhere firmly to the glass, but should not crumble with age.

The method of connecting the base with the socket should be such that the lamp may be easily replaced with no danger of a short circuit, and the device for bringing the poles of the socket in contact with the poles of the base should be of such a nature as to insure at all times good contact. The poles of the socket and the poles of the base should be thoroughly insulated from the exterior brass shells. The method of making the exterior shells serve the purpose of one of the terminals cannot be too strongly condemned, if for no other reason, simply on account of the danger of shock to the person replacing the lamb. Further, the catch for holding the lamp should be such as to render it impossible for the lamp to jar itself free and fall.

If the different companies had not quite generally practiced a method of exclusion with reference to the methods of connecting the filament with the platinum wire, as at *B*, Fig. 2, all practically arriving at the same result, it would seem necessary to speak with considerable detail as to the construction of this particular part of the lamp. No other part of the filament is subjected to such severe conditions. At this point the tendency to arc from pole to pole is a maximum, as well as the mechanical strain due to the weight of the filament and to internal stress. Therefore it would seem that the following are some of the conditions which should be fulfilled :

1st. Perfect contact must be established between the platinum wire and the filament.

2d. Whatever the material may be which acts as the intermediate body between the filament and the wire, it should have a coefficient of expansion and contraction very nearly that of the filament.

3d. The intermediate body should not volatilize at any temperature to which it may be subjected.

The examination to which the filament should be subjected will be brought to light more clearly perhaps by a consideration of the work it has to perform. When the lamp is put in circuit it is heated suddenly to a very high temperature, always above a red heat, and when the current is switched off the filament cools quite as suddenly to the temperature of the surrounding air, and this process is repeated day after day, and often several times each day. It needs no demonstration to show that this oft repeated heating and cooling must prove a very severe strain on the filament. Nor is this the only strain to which the filament is subjected, for in some classes of lamps, in order to distribute the light more equally in all directions, a half twist is given to the filament before mounting it on the glass stem which causes it to assume the form shown in Fig. 2. The normal form of this filament is that shown in Fig. 3, so that, at the outset, the filament is subjected to a mechanical strain of a half revolution, when in a large precentage of cases it would break at a whole revolution. It does not follow, however, that the filament having the form shown in Fig. 3 is not in a strained condition, for the normal form of these filaments may be with the ends considerably further apart, giving them more of a V form. In many, if not all of these cases of initial strain, the stress is aggravated rather than relieved by the passage of the current.

From these considerations it is evident that of any two lamps whose filaments are under the same initial strain, one of the deciding elements of merit will be its tensile and torsional strength, and of any two lamps whose filaments have the same tensile and torsional strength, the deciding element of merit will be the amount of initial stress.

It is not a difficult matter to decide as to the relative tensile and torsional strength of different classes of filaments, as there is such a wide variation. This variation may be distinguished even by so rough a test as taking the filament in the two hands, and being careful to keep it in the same horizontal plane, pulling till it breaks ; also for torsional strength, taking the filament as before and being careful to maintain a uniform longitudinal strain, revolving one end of the filament, noting the number of turns and fraction of a turn at the time of rupture. As to the initial strain, it will manifest itself in any lamp the filament of which has been accidentally broken, by a tendency of the ends at the point of rupture to separate.

The microscope should be made use of in examining the structural condition of the filament, and for this purpose a filament must be removed from the bulb and mounted on a glass slide. In order to remove the filament from a lamp, file across the sealed end *A*, Fig. 2, till the extremity cracks off. The end may then be filed with the flat of the file till a slight hissing is heard due to

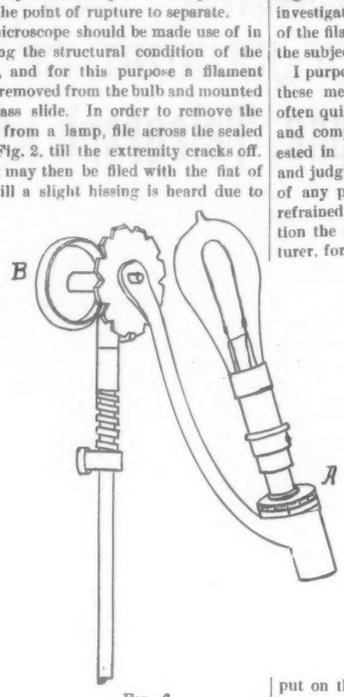

Fig. 6.

the entrance of air in the bulb. When the air ceases to enter, the glass may be broken from around the filament with but little difficulty.

There is no doubt that one of the most important elements in the life of a filament is its homogeneity of material and uniformity of cross section. It would seem then that that material which, in its raw state is most homogeneous, would prove most satisfactory, since the structural condition of the filament is not materially affected during the process of manufacture. On the other hand, since the quantity of light depends partly on the surface area of the illuminating body, there may be within certain limits an advantage in a cellular structure, as the actual cross section of conducting material will remain the same but occupy a larger space. This would make the surface area larger and utilize incandescent particles that otherwise would be in the interior. In cellular filaments, however, the amount of occluded gas is notably greater than that in a dense, structureless filament. This gas, as is well known, is gradually driven off, diminishing thereby the excellence of the vacuum, and the heat given off by the lamp is proportionately increased. This is an important consideration, for it strikes at once at one of the strong points urged by electric light companies in comparing the incandescent electric light with gas.

The degree to which carbon is deposited on the bulb is an important consideration, not only on account of the light intercepted, but on account of the deteriorating effect on the filament which must follow as a consequence. The exact cause of "blackening" has never been, to the writer's knowledge, satisfactorily proven by systematic investigation, but that the physical condition of the filament has an important bearing on the subject there is little room for doubt.

I purposely wish to bring into prominence these mechanical questions which are so often quite neglected by electrical engineers and completely ignored by the men interested in a purely business way, in testing and judging as to the standard of excellence of any particular class of lamps. I have refrained, too, from taking into consideration the question of cost to the manufacturer, for the different classes of lamps are put on the market at practically the same price.

We now come to the consideration of the electrical properties of the incandescent lamp.

For reasons which will appear the following data should be determined :

1st. Cold resistance in ohms, before photometric test.

2d. Photometric test.

1st. Current in amperes.

2d. Electro-motive force in volts.

3d. Average candle-power, horizontal and spherical.

3d. Cold resistance in ohms, after photometric test.

4th. Duration of test.

From this data the following results may be derived by calculation :

Let C represent the current, V the electro-motive force, and C. P. the candle-power' then we have H, being the hot resistance of the lamp,

$$H = \frac{V}{C} = \text{about } \tfrac{1}{2} \text{ of the cold resistance.}$$

W being the total watts.

$$W = V \times C$$

S. C. P. being the average spherical candle-power, and H. C. P. being the average horizontal candle-power.

$\frac{W}{S.\ C.\ P.}$ = Watts per spherical c. p., or

$\frac{W}{H.\ C.\ P.}$ = Watts per horizontal c. p., so called efficiency.

$\frac{746}{\frac{W}{C.\ P.}}$ = Candles per electrical h. p.

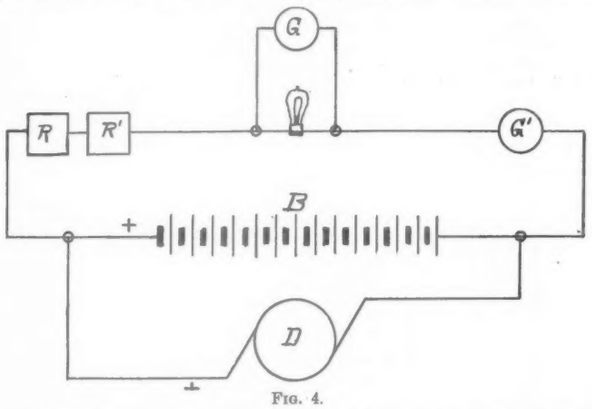

Fig. 4.

It may be unnecessary to remark that the relative positions of the apparatus used in making the electrical test are as shown in Fig. 4. *D* is a dynamo connected with the storage battery *B* so as to charge it at the same time the current is being used for the lamp test, and thus producing a very uniform potential. *R* and *R'* are rheostats, one for fine, the other for coarse adjustment of the potential of the lamp. *G* is the potential galvanometer which is connected in shunt around the lamp and consequently measures the difference of potential of the current upon entering and upon leaving the lamp. *G'* is the current galvanometer, and measures the current passing through both the lamp and potential galvanometer, but as the resistance of the potential galvanometer will be over 50,000 ohms, the amount of current passing through it may be neglected.

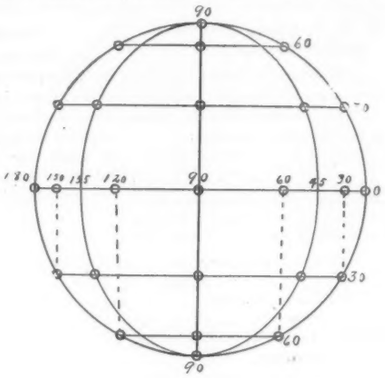

Fig. 5.

In making the photometric tests four persons will be required, one to read the current galvanometer, one to read the potential galvanometer, one to take candle-power readings, and the fourth to adjust the lamp after each reading at the proper angle for the next reading. If the photometer and galvanometer are in different rooms, a system of signaling by means of an electric bell should be adopted. The wires leading to the galvanometers should be twisted in order to avoid any electro-magnetic action on the instruments due to the passage of the current. The persons reading the galvanometers must have no iron about them, as, for instance, knives, keys, iron-pegged shoes, buttons, etc.

As to the points on the lamp where readings should be taken in order to arrive at the average spherical candle-power, two conditions must be considered ; the points must be so situated that the lamp can be adjusted easily and accurately to any one of them ; there must be a sufficient number of points to produce a true average. We naturally turn to the icosaedron, as being a regular polyhedron, having the largest number of vertices that can be circumscribed by a sphere, but there are two objections : First, the lamp could not be easily and accurately adjusted at all of the vertices ; and, second, there are not a sufficient number of vertices, twelve, to give an average result. The points shown on the hemisphere, Fig. 5, conform very nearly to all the conditions, the exception being that they are not mutually equi-distant. Nevertheless, by using for the lamp holder an apparatus similar to that shown in Fig. 6, in which *A* is an adjustment for longitude and *B* for latitude, ease and accuracy of adjustment is obtained, and there being 38 points for readings, a good average is obtained.

As will be seen, we obtain from the electrical test but little more than the "efficiency," which, as pointed out at the beginning, means nothing except when combined with a more or less definite knowledge as to the life. We do indeed derive some indication as to the life by comparing the cold resistance before the test with the cold resistance at the conclusion, but it must be admitted that the inference, at best, is very indefinite. The test described is far more elaborate than that usually carried out by the manufacturer. Indeed, about the only test indulged in by the manufacturer is a classification test. The method of using an

incandescent lamp as the standard for candle-power is poor at the very best, and is especially to be condemned when a poorly standardized voltmeter, as is the usual case, is employed to maintain the lamp at the proper E. M. F. If this lamp thus used as a standard is one obtained in the market from another manufacturer, the error is multiplied indefinitely. If the classification is made by means of putting several hundred lamps on a rack, and raising them to a given E. M. F. while an attendant surveys the whole, discarding those which appear in his judgment either too bright or not bright enough, no standard of candle-power whatever is used, and the method is consequently open to serious objections. Another inaccurate method of classification is that of taking the cold resistance as the basis, for in this case the candle-power is eliminated entirely. Generally speaking most of the classification tests fail either in employing inaccurate standards, or in not considering at all one or more necessary factors.

Of course no such extended test as that described is at hand for the use of the consumer, and it is for this reason that the mechanical examination of lamps is to be particularly commended. Nevertheless, by substituting for the tangent galvanometers above, well standardized commercial voltmeters and ammeters, a fairly satisfactory electrical test may be made.

Since every part in the incandescent lamp is absolutely dependent on every other part, the task of manufacturing lamps of great uniformity and excellence is rendered very difficult; but when we take into consideration that some lamps have a life of 5,000 or even 10,000 hours, we have presented to us an average standard that should be reached by every manufacturer. It is true beyond any question that if one lamp can be brought to such a degree of excellence, with proper care and with sufficient investigation as to cause and effect, all lamps may be brought to the same standard.

In concluding, it may be said that we owe very little to the present for any excellence possessed by the incandescent lamp, but very much to the past. At the present time the quality of the lamp is completely ignored by the men controlling the manufacture, while the question of cost is made supreme. That this is radically wrong, and will result disastrously to those interested in incandescent lighting as a legitimate enterprise, needs no argument.

Electric Motors for Church Organs.

Not least among the many uses which electricity now subserves is its adaptability through the medium of motors to the operating of church organs. During the last two or three years experiments have been made to this end by the various electric light and electric motor companies, which have finally resulted in the perfecting of a machine which is fast revolutionizing the antiquated methods of providing large organs with a satisfactory motive power. The small space that the motor occupies, the evenness of its blowing, and the facility of its control in starting and stopping, as well as in regulating, and the little attention required, are the special advantages claimed for it over any other power used for this purpose. It runs with practically no noise, is free from heat or odor, gives no trouble from frost in the coldest weather, and is always to be depended upon to do what is asked of it.

Grafton, W. Va.—The Grafton Gas and Electric Light Company, for the purpose of establishing gas and electric works in Grafton, Taylor county. The charter will expire on August 5, 1939. The sum of $600 has been subscribed to the capital stock, 10 per cent. of which has been paid in, with the privilege of increasing the same to $50,000 in all. The shares are $100 each, and are held by George Brinkman, John T. McGraw and Leonard Mallonee, of Grafton, and Henry Miller, J. W. Hamilton and J. F. Lagge, of West Grafton, one each.

—— There are over 288,000 arc lamps and 2,800,000 incandescent lamps in use in electric lighting in this country.

"Storage Battery Traction."

MR. BRACKEN'S ADDRESS ON STORAGE BATTERY TRACTION, PRESENTED BY MR. S. MARSH YOUNG, BEFORE THE NATIONAL ELECTRIC LIGHT ASSOCIATION AT NIAGARA FALLS, AUGUST 7, 1889.

Mr. President and Gentlemen:

I have been invited to address you on the subject of electric traction by storage batteries.

It has been customary for speakers on storage batteries to begin their discourse by apologizing for their subject. That day has gone by. The storage battery has no longer any apologies to make.

My purpose at first was to give a detailed account of the progress of storage battery traction by going back to 1881, when the first storage battery car was run, and following up the history of improvements from that time to the present. But I have found it impossible to get full and reliable data as to the work accomplished in Paris, in England, or in this country. I wrote to almost all the companies and individuals who have been engaged or are now engaged in storage battery traction to send me full accounts of their experiments and work; but I regret to say that only one responded to my request, and that was Mr. A. H. Bauer, who gave me a very interesting account of his experiments with his storage battery car in Baltimore, in 1885-86. The published accounts of the operation and experiments of storage battery cars in Europe are so obviously inaccurate as to be unworthy of reproduction. There is one exception, however, to this, and that is the account given by the jury of commissioners at the Antwerp Exhibition of 1885 on the work of the storage battery car exhibited there; but, as you are all more or less familar with that report, I will make no further reference to it. I am, therefore, compelled to confine my remarks to my own observation of storage battery traction. I will not weary you with threadbare information. I once heard a judge tell a loquacious lawyer that he must assume the court knew some law. I will assume that you have a pretty general acquaintance with the storage battery in lighting and in traction; but there may be some features, chiefly commercial, that have not come under your observation. My observations cover a period of over three years, during which time the company with which I am associated has directed its talents and energy to the development of storage battery traction. You all, no doubt, appreciate the difficulty of the task—not alone difficulties inherent in the system itself, but difficulties arising from the skepticism and lack of sympathy, I regret to say, of a very large majority of the electric community. We all know that much skepticism on the part of street railway men has had to be overcome in electric traction of every kind. It has taken a great deal of hard work—of missionary work—on the part of electrical engineers and inventors to bring about present results. But this is not to be wondered at, for there is nothing harder to accomplish than to supersede an old and well-established system. The horse car had plodded along and gathered strength and influence just as it gathered fares. That influence was wide spread and almost all pervading; for there is hardly a town on this great continent that has not its horse car line. The horse car system had been spreading for about 50 years, and, when it came to be in full and undisputed possession of the field, can it be wondered that those men who had the hardihood to attempt to supersede it should be regarded with more or less suspicion—should be looked upon as pretenders—especially when you consider that the method which they propose to employ was electricity; that dark and mysterious science, as many people, even now, regard it.

Now, the first experiments made with electric cars were calculated to increase this suspicion and to throw disfavor on electric traction; for it is a characteristic of inventors to be so far carried away by their enthusiasm as to commit great indiscretions in carrying on experiments in public which really should be conducted in private. It was on this account that the early experiments of Daft in 1883, and of other well known electrical engineers in succeeding years, while they created wonder, did not beget confidence. I may say without any invidiousness that two years ago there was not a single electric car run in this country that proved anything more than possibilities.

There were probably two dozen cars being run at that time by the overhead wire system; but so unsatisfactorily, that people who went to see them came away shaking their heads with distrust. Now all this distrust has disappeared and electric traction has grown so fast, that to-day there are no less than 100 street car lines in this country that are either running their cars by electricity or are in the course of introducing the system. Electric traction has, beyond all doubt, come to stay; as the French say, it has arrived. But the large cities are threatened with the cable. The storage battery proposes to challenge its supremacy.

There is a very general popular misconception of the nature of the storage battery. I suppose that at least 90 per cent. of the public have an idea that storage batteries are nothing but buckets full of electricity. We read in the newspapers, from time to time, of storage battery cars carrying "tin tanks" filled with electricity. There can be no greater misconception of the nature of the storage battery. The clearest idea I can give you of the energy contained in a storage battery is to compare it with a lump of coal. The source of energy in a battery is identical with that contained in coal. It is merely energy locked up in a number of substances, principally the metals which, when set free in a certain manner, manifests itself in a certain phenomena we call an electric current. The metal almost universally used in the storage battery is lead in its various forms. In this load is contained latent energy, the same as in coal, and if we compare the amount of work accomplished by the energy from either source in foot pounds, we will find it to be exactly equal in both cases. Now the general principles involved in a storage battery are very simple. When we charge a battery from a dynamo or other external source of electricity, we are manufacturing lead, and when we discharge a battery through an electric motor or series of lamps we are simply burning lead. But there is this difference between the action of coal and lead that whereas coal apparently disappears when burnt, the lead does not, but is converted into sulphate of lead to be converted back to metallic lead again by a reversal of the current; so that the storage battery is alternately burning and reducing lead to and from one of its salts. This is why the storage battery lasts and does not disappear in the extraction of the energy as coal apparently does. In fact, the storage battery is an ideal illustration of the conservation of force and the indestructibility of matter.

When the storage battery first became known in a practical and commercial form by the experiments of Plante in 1859, scientists foresaw for it a great future, and when corporations were formed later on to exploit and introduce the storage battery, the people of Europe, influenced by what might have been considered the extravagant praises of Sir William Thompson and other well-known scientists, put an enormous amount of capital into storage battery enterprises. Almost all of those enterprises, however, proved to be commercial failures; first, because the exploiters were ahead of their time; and second, because the public were led to expect more than the storage battery, in its then crude form, would do.

There probably have been few things more difficult to accomplish than to bring the storage battery to its present state of commercial value. Notwithstanding all that had been written about its nature and characteristics, its treatment, both in its manufacture and use, has, until very recently, been purely empirical. That stage, fortunately, has been passed; so that, with intelligent care, the storage battery to-day is not only a valuable adjunct in lighting, but is becoming a very prominent factor in traction.

The advantage in storage battery traction, assuming that it is practical and economical, are too obvious for me to occupy your time in recounting.

The obstacles in the way of the success of the system are largely, if not wholly overcome. The chief of these was the handling of the batteries. That was the most difficult and the last obstacle to be overcome. Two improvements removed these difficulties. First, the flexible connector, by which it is possible to couple up or remove cells with great rapidity; and secondly, the battery rack, occupying a floor space of 24x7 feet on each side of the car, wherein can be stored a sufficient number of batteries to run from 10 to 20 cars, according to its location. This rack represents stall room for 150 horses, or say 6,000 square feet. I regard this rack as the greatest improvement hitherto made in storage battery traction. By its aid we remove the batteries from a car and replace them by another set in from two to three minutes. Indeed, the cars on Madison avenue, New York, have to leave the station on six (6) minutes headway. In the afternoon trips there is but six minutes interval between their arrival and departure; and they all receive their batteries from the same rack. When the car enters this rack, its panels are dropped down on either side and thus form bridges over which the batteries are withdrawn from and replaced in the car. While this change is being made, a competent person inspects the regulators of the car. The motors, gearings and connections are only inspected once a day, and that at the end of the day's work. You will thus perceive that the great bug-bear of how to store the batteries is no longer an element in storage battery traction.

From my observation of the recent work on Fourth and Madison avenue, now that a number of cars are running and under very unfavorable conditions as to station room and the like, I am led to believe that the storage battery car is as free, if not freer from accident, as cars that are run by the overhead system. The motors are, I think, subjected to less trying conditions, owing to the fact that the E. M. F. is always uniform. The batteries never give out on the trip. It is impossible for them to do so, as they leave the station with 35 electrical horse-power hours stored in them, and do not consume quite 12, in the round trip of 12 miles. The battery in service have never been short-circuited. When the current required exceeds 150 amperes, the battery is automatically cut out. When rigid connectors were used, breaking was frequent, and the flexible connector has until recently given some trouble from time to time by jumping out of position, while the car is in service; but with recent improvements, disconnection of the batteries, while the car is in service, is now rendered almost impossible. For several months past the regulators have caused absolutely no trouble. In any event, there are two on the car, so that if one should fail, the car may be operated from the other end. You will thus perceive that the likelihood of accidents or break downs is reduced to a minimum. The first standard car has run in three months over 6,000 miles and carried over 80,000 passengers, never having missed but one half a trip in that time; and that arose from a bent axle. It has never had an accident or stoppage of any kind while in service. Do not be skeptical at the assertion that not a dollar has been spent on that car in the way of repairs or alterations.

At this stage you will naturally ask, how about the life of the battery? I answer that from our observation, we have nothing to fear on that score. We only ask a life of six months from the positive plates is sufficient; it is found that they will last very much longer than that. The chief reasons why the short-livedness of a storage battery has been so much talked about and feared, is that it has, until recently, cost so much to manufacture the battery. Now, the material for your battery you have to buy, in a great measure, but once for the reason that the discarded battery can be made over new. The raw material in two sets of battery, capable of running a car 120 miles a day, costs, exclusive of the containing jars, about $300. Have you machinery and devices requisite for manufacturing this raw material cheaply into a battery? If you have, you need have nothing to fear on the score of economy. It will cost $4,000 to purchase enough horses to run a 16 foot car 120 miles a day; it will cost about $1,500 to purchase enough battery to do that work. The batteries can be maintained for about one-half what it costs to maintain the horses; and by maintaining, I mean replacement as well as feed. This I know for a fact. Can we then have any further doubt as to the relative economy of storage battery traction.

The cars on the Madison and Fourth avenue line take one electrical horse-power hour per mile. The road has some long gradients. The grade at Centre street is over 4½ per cent., and 600 feet in length.

The cost of motive power for a car day of 75 miles we estimate at $3.40, as against $7.50 for horses. Five dollars for 75 miles ought to cover the cost in winter. By motive power we mean the cost of energy at two cents per horse power hour, and $700 per annum for maintenance of batteries and motors. To those who may think that two cents per horse-power hour is a low estimate, it may be said that power has been offered in New York, to be delivered at the station, at the price above named. In towns outside of New York, offers have been made to supply current at lower figures. The more level the road, the cheaper, obviously, will be the cost of motive power. This is more particularly true of the storage battery, which, in excessively steep and long grades, becomes heated. The chemical energy, instead of exhibiting itself in the form of electrical energy, exhibits itself in the form of heat, with consequent injury to the battery. Cars will ascend very steep grades, but it is not deemed economical to attempt grades of more than six per cent., and they must be short at that rate. But there are few roads offering more and steeper grades than the road we are now operating on in New York. Each car has two sets of battery. A set is easily charged in about two-thirds of the time the other is in service. No time is lost in charging, as the battery is automatically put in circuit with the dynamo as soon as it is withdrawn from the car. Now that there is a complete group of cars in service in New York, it is hoped to follow those by another group of ten. More will be known about storage battery traction at our next meeting.

Hartford, Ct.—The Bryant Electric Company is among the new corporations formed in Bridgeport. The company will sell electric supplies, and has a capital of $5,000, of which $3,000 has been paid in. W. C. Bryant is president of the new company.

Winthrop, Me.—The Winthrop Electric Light Company; capital stock, $10,000. They will put bonds upon the market immediately and begin operations at once should the stock be quickly taken. All business places and many private residences will be illuminated.

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We invite correspondence from Electricians, Inventors, and the Telegraph and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

NEW YORK, AUG. 24, 1889.

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Mr. Thomas A. Edison is receiving a warm welcome from the French scientists, and will remain abroad several months. King Humbert has presented him with the insignia of a Grand Officer of the Crown of Italy, and Mr. Edison is now a count and his wife a countess.

Postmaster-General Wanamaker and Dr. Norvin Green, president of the Western Union Telegraph Company, are reported to have had a consultation at Saratoga over the question of rates for government telegraph messages. We do not think the rate of one mill per word will stand. It is certainly not a just one.

In the forthcoming United States census report there should be a special section for the electrical industry.

With an invested capital of $600,000,000, the electrical industry of the United States should be strongly represented in the World's Fair, no matter where it is held.

Another gas explosion in New York destroys a life and severely injures a score and more of people. Shall we read long and thrilling accounts of this deadly and destructive element in the daily press? No, indeed. But had the electric current burnt a careless man's finger or shocked some one, how extravagant would be the account. Can any one explain why this is?

Minneapolis is the telephone Mecca at present. It would seem that the eastern telephonists will go out in force to this far western city, and we may expect a very good Convention. Cables and switchboards will, no doubt, be the leading topics, and there is room for improvement in both, and the able telephone workers are just the ones to say where the improvement is needed.

President Weeks has a queer conception of his duty as presiding officer of the National Electric Light Association. On Wednesday he agrees with Mr. Morrison that the new constitution cannot take effect until the end of the year, saying (according to the official report): "We certainly could not legislate members out of the Association." The next day when a personal gain or loss depended on his decision, he did what he "considered his duty," and stultified himself by deciding that the new constitution, which had been adopted by a disgraceful trick, did take effect at once, and did "legislate out of office." Oh, Mr. Weeks, either that conscience of yours or your memory is in a bad way!

In 1876, only 13 years ago, only as long as it takes a young miss to grow into tolerably long dresses, we had but a couple of Gramme machines and a few lamps of a very crude and unsatisfactory construction and wonderfully low efficiency at the Philadelphia Centennial. Just think of it, seriously, thoughtfully, with your eyes shut, for one moment, and then say to yourself, there are $300,000,000 to-day invested in the electric light business, with over 237,017 arc and 2,704,768 glow lamps, and the 109 railways with nearly 800 miles of track, and 1,000 motor cars in daily service! and then, say if you can, what the power is, or the energy is, or the force is, or the whatever you call it is, which is doing all this work. And again, predict if you dare what the next 13 years, while that laughing little miss is growing to be a staid matron, what that 13 years will have accomplished with this same unknown and unknowable laborer in the world of science, and art, and the domestic economy of the world.

The point made by Mr. H. A. Reed, at the Niagara Falls Convention of the Electric Light Association, is one that should make those responsible for the unmanly work of the last session thoroughly ashamed of their action. The force of Mr. Reed's remark, that they were willing to accept the "brains and money" of the associate members and "yet kick them out," will be seen when the work of the present Convention is analyzed. There were ten set addresses delivered, seven by associate members (under the new constitution), and three by central station men; there were six standing committees to report, and only the chairman of one, the Executive Committee, was a central station man. We think the few who pretended to speak for the central station representatives in the entirely uncalled for and most unjust attack on the supply interests, realize by this time that they have made a colossal blunder, one that no self-respecting central station representative endorses. A prompt acknowledgment of this fact, with an ample apology to the Association they have so greatly harmed, should be forthcoming from Mr. Weeks and Mr. Morrison, ere it is too late to rectify the serious mistake they have made.

PRES'T WEEKS'S EXPLANATION.

President Weeks, of the National Electric Light Association, undertakes to explain his action at Niagara Falls, in a communication to the REVIEW. He builds two or three men of musty straw and with much self applause knocks them down, and then proceeds with an argument that makes one think of that old definition of thunder which describes it as "a loud noise heard by people not deaf." Mr. Weeks's evasive defense is that all he did was in "strict accord with parliamentary law." Does he explain the decisions of his assistant presiding officer, against which he did not protest, on the same ground? Was it "parliamentary law" for Mr. Weeks to decide one day that legislation was legal which he had declared the day previous would be illegal? Mr. Weeks, the members of the National Electric Light Association do not care for your opinion on "parliamentary law." They know when they have received proper treatment from a presiding officer, and the sentiment comes to the REVIEW from all quarters, and with unmistakable emphasis, that you acted the part of an inconsistent and unjust presiding officer and resorted to trickery to secure personal ends.

You were wrong in putting the motion to "accept" under your interpretation of its meaning, and, besides, you had stated the day before that such action "could not" be taken; you were wrong in all equity and justice in deciding that this motion *adopted* the Constitution, and you were most selfishly wrong in deciding that the Constitution thus adopted took effect at the moment it was to your personal advantage to so decide. Then was the time for you to have been broad enough and wise enough to have respected the rights of your peers on the floor of the Convention.

A NATIONAL LABORATORY.

Inventors will be interested in a movement that will be made in the next Congress. The present patent laws give inventors patent rights for a term of seventeen years, to be renewed for eight years by special act of Congress. The measure proposed to be introduced in the Fifty-first Congress will provide that all extensions of patents shall be in the jurisdiction of the Commissioner of Patents. This will obviate the delays attendant upon the passage of special bills through Congress and will leave the whole business of extensions in the hands of a public functionary. Of the 402,000 inventions, the N. Y. *Sun* states that 55,000 have extensions already to be asked for. A feature of the proposed bill is the establishment in Washington, at government expense and under Government control, of a large chemical and mechanical laboratory. It is estimated that such a laboratory will not exceed in cost the sum of $15,000, or at most $20,000. Similar private laboratories have been set up for $10,000 or $12,000. At present there are no laboratories in Washington accessible to inventors. Great stress is laid upon the necessity for a national laboratory for the special use of inventors, and it is claimed that the benefits accruing to the nation from the establishment of one will outweigh all considerations of cost or whatever objections may be raised.

The trouble with the electricians is that they do not want a method of execution which makes of an electrician the executioner. Mr. Harold P. Brown does not feel that way, for he has contracted to kill Kemmler, but he is the only electrician who could be found to engage in such revolting business.—*New York Sun.*

A German paper has recently stated that a solution of sodium chloride, or common salt, may be made use of to cover incandescent lamp globes, to break up the glare, and diffuse the rays without materially lessening the amount of light. Salts of tin and lead are also suggested. Colored collodion has been used extensively for coloring the globes, but it is very apt to crack and peel off. The last application was simultaneously discovered by nearly everybody in the business, and about as simultaneously abandoned.

THE POWER OF NIAGARA FALLS.

The question of utilizing the water-power of this, the grandest and most magnificent of Nature's exhibit of power, has repeatedly agitated the public, and the question was repeatedly asked at the Convention, "Why can't, or why doesn't some one utilize that immense water-power which is wasting so prodigally? Oh, if I had just that little fall that you see there, tumbling over that rock, that small fraction of these magnificent rapids at my station; what a blessing, what a saving, what a value there would be in it," was what many thought while gazing from Goat Island bridge at the jolly mad rush of waters turning their last glad summersaults preparatory to the last wild plunge over the brink.

Many of the members of the Association were gazing upon the Falls for the first time, and many had witnessed the Falls before and admired the grand and awful spectacle, but the idea of connecting the beautiful with the useful, comparing the gambolling with the sober, laboring qualifications of the torrent, only came to them as a co-relative result of their calling.

There is, as was stated by the Hon. Mr. Ely, who received and welcomed the Convention at the Falls, an almost incalculable amount of power lost at Niagara, and it is a matter wholly problematical, whether the park commissioners or other authorities who possess the Falls and control the hack drivers, will permit any general interference with one of Nature's grandest and sublimest curiousities.

But, at any event, that this power may be and is used to a very considerable extent, is shown by the following list of parties now using the waterfall at Niagara, through the medium of a canal which carries the water from a point above the village and discharges it below the cataract:

	H. P.
Central Milling Co., Flour	1,000
Niagara Wood Paper Co., Wood Pulp	1,000
Schoellkopf & Mathews, Flour	1,000
Cataract Milling Co., Flour	500
Cataract Manufacturing Co., Wood Pulp	500
Pettebone Paper Co	150
Water Works	250
Jno. T. Quigley, Wood Pulp and Paper	1,000
Oneida Community, Limited, Silver Plating	400
Bush Electric Light Co	125
Carter & Co	25
Total	5,900

THE COMING TELEPHONE CONVENTION.

The 11th meeting of the National Telephone Exchange Association will convene at the West Hotel, Minneapolis, Minn., on Tuesday, September 10th prox., at 11 A.M. It will probably continue in session during Tuesday and Wednesday, while Thursday will be devoted to sundry entertainments planned by the Northwestern Telephone Exchange Company. The usual number of papers will be read and discussed. Secretary Barney announces that the special vestibule train for Minneapolis is now an assured fact, and barring some unforseen calamity, like the Johnstown flood, will positively leave Jersey City at 9.15 A.M. on Sunday, September 8th. This train, it is predicted, will be the finest ever run out of New York, and will be composed of entirely new cars, with all the latest improvements, lighted by electric light throughout. The dining car will be manned by a picked corps of waiters, and the "composite" car will contain a library, bath-room and barber shop. The whole train will run through to Minneapolis without change, and will be accompanied by an agent of the Pennsylvania Railroad Company, who promises to leave nothing undone to promote the comfort and pleasure of the party.

The passengers on the special train will be entertained at Chicago, with a drive over the city and through the parks, Monday afternoon. The train will arrive at 9 A. M. and will depart at 5.30 P. M. for Minneapolis, giving the visitors the day in which to visit the Garden City.

At Minneapolis, on Thursday, the telephone visitors will be treated to a ride over the city, starting from the West Hotel, at 9 A. M., then by train to Minnehaha where lunch will be served. After lunch they will take the train to Ft. Snelling, then to St. Paul for a drive over the city, and in the evening a banquet will be served at the Ryan House.

The Official Records.

CAN MESSRS. WEEKS AND MORRISON EXPLAIN THIS?

The following extracts from the proceedings of the National Electric Light Association, as given by the official stenographer, present a picture that will fill with regret every member of the Association who, with the REVIEW, had always heretofore believed that Mr. E. R. Weeks, of Kansas City, and Mr. J. F. Morrison, of Baltimore, were incapable of sacrificing their self-respect and integrity as presiding officers for the sake of personal advantage:

WEDNESDAY AFTERNOON SESSION.

[On the motion to consider the new constitution.]

"Mr. Morrison: * * * * The committee was created by this Convention, and its work will have to be passed upon by this Convention; but if you take up a paper with a view of disposing of it, article by article, there will be no difficulty with getting through with it in a very short time. Every one will be prepared to present his views as it comes up, but there is one point you have not considered. *There is no constitution you can pass now that will be operated until after the expiration of the fiscal year.*

"The President (Mr. Weeks): *We certainly could not legislate members out of the Association.*

"Mr. Morrison: No, sir. The gentlemen here *have paid their* $20 *for active membership in the Association.* I have paid my rent for twelve months, and you cannot put me out until the expiration of the year, and *you can pass no legislation which will take from them the right which they have paid their money for.* So before you get through you will have a motion to leave that matter until the time comes when the paid term of these gentlemen has expired. These gentlemen have paid their rent for a year."

THURSDAY'S SESSION.

[On the motion to hold the next meeting at St. Louis instead of Kansas City—the latter city the home of President Weeks—and which had prevailed by a vote of 19 to 11.]

"The President: The ayes have it.

"Mr. Morrison: Now, Mr. President, before a decision is rendered in this case, I want you to make one other decision; that is, whether we are operating under the new constitution or under the old one.

"The President: *Under the new constitution.*

Mr. Morrison: Then the vote had now is null and void, because the vote is confined to active members.

"The President: * * * * Sentiments that have been expressed upon the floor of this Convention surprise me and pain me more than I can express. But, as *I am called upon by the gentleman from Baltimore to decide the point raised by him, I must do what I consider my duty, and I decide that the point raised by him is well taken.*"

PERSONAL.

Mr. S. S. Leonard, of Minneapolis, has been visiting New York the past week, on his return from the Niagara Falls Convention.

Mr. Nikola Tesla, the inventor of the Tesla motor, sailed for Paris, France, on the French steamer, "La Champagne," last Saturday. Mr. Tesla will be absent about two months.

Mr. Jesse M. Smith, the well-known electrical and mechanical engineer, of Detroit, Mich., has returned from an extended European trip. He found little new in electrical circles abroad.

The Poetry of It.

[New York *Sun*.]

Our esteemed contemporary, the *Ironton Register*, discusses impressively the question of electrical execution, and its propositions lose nothing by being put in verse:

ELECTRICAL EXECUTION.

They placed the form of the murderer
Upon the electric rack,
And fired 1,700 volts
Into his naked back.

He quivered an awful moment,
Then quietly raised his head,
And asked that his friends might take
The corpus of the dead.

But the cruel executioner
Again discharged the bolts—
At least a score or two of ohms
And full 3,000 volts.

"Now this is simply shocking,"
The murderer did say;
"Go get a rope and let me die
In the good old-fashioned way."

This is all true; but in the State of New York there is an added atrocity in the unprecedented secrecy with which the proceedings are to be surrounded. Care has been taken by the cranks who framed the statute not only to make it unconstitutional as regards the press, but to prevent any publicity of their horrible transactions.

President Weeks Undertakes an Explanation.

TO THE EDITOR OF ELECTRICAL REVIEW:

As objections have been raised to certain rulings of the chair at the recent convention of the National Electric Light Association, and as some have even stated that legislation was intentionally hasty and unfair, it seems proper to analyze the rulings in question to show that the decisions were, in all important particulars, in strict accord with parliamentary law.

No subject ever brought before the association has been more generally and perfectly understood than was the report of the committee on amendments to the constitution. Every member had, by means of circular letters, been given an opportunity during the past six months to express his views as to the needed changes. The replies received by the committee were almost unanimously in favor of the amendments as adopted.

These amendments were submitted to the convention article by article on the first day of meeting, and were made a special order of business for the third. Copies of the proposed amendments and also of the old constitution were distributed.

By reference to the minutes of Thursday's proceedings, it will be seen that after the re-reading of the amendments, a motion was made and seconded to accept the report of the committee. According to the parliamentary law, *to accept* is to adopt (see Cushing, chap. xv., sec. iv., par. 295); and the mover in this case, an associate member, stated to the convention that he used "accept" understandingly, and that the chairman put the quesion correctly. Therefore when the motion prevailed, the new constitution became the organic law of the association and the chairman was obliged to decide in accordance therewith.

An objection that the votes upon which it was carried were not counted to determine a two thirds majority would have been valid. But as the *viva voce* vote was unanimous, the point did not occur to the chair; and as no objection was made until long after the result had been announced and the house had proceeded to other business, it could not then be in order.

The idea of taking up the amendments *seriatim* was good, but it was presented in the form of a suggestion which was not accepted by the mover of the question under consideration. Even in the form of a motion, it would have been out of order, as a motion was already before the house.

A motion for reconsideration was made, but as it came from one who admitted that he had not voted on the original motion, by parliamentary usage it was not in order. (See Cushing, ch. xiv., par. 257.) The immediate presentation and seconding of a new motion prevented all further discussion of the previous question.

The point is raised that the decision of the chair deprived of franchise those who had paid dues for the present calendar year. This objection overlooks the fact that the associate members were seeking to control legislation providing for a meeting to be held nearly two months after the close of the calendar year, and therefore entirely beyond their jurisdiction, even had the amendments been formally accepted as taking effect at the expiration of the current year. Had this phase of the question occurred to the associate members, I am confident, in view of the generosity which they evinced in originating and carrying on the whole amendatory movement, that the feeling would have been quite different.

From the foregoing, it appears that the efforts of remonstrants were ineffectual through their own unparliamentary procedure; not through unfair or illegal decisions.

When the excitement of the moment has passed, it must be recognized that the decisions were not only strictly legal, but just; and all will see that their interests still lie with the National Electric Light Association.

EDWIN R. WEEKS.

Mr. Henry Metzger, president of the National Telephone Exchange Association, returned from Europe last Thursday, having spent three months visiting Paris and other interesting points. Mr. Metzger will attend the meeting of the Telephone Association in Minneapolis next month.

Mr. Balbis y Rodriguez has established himself in Havana at the head of an electrical house. This is the first and only establishment of the kind on the island and deserves success. Manufacturers in this country desiring representation there will find Mr. Rodriguez an active, reliable representative.

Mr. T. C. Frenyear, formerly of Boston, has become a part of the very capable staff of the Brush Electric Company, and will make his headquarters in New York State.

ANNUAL CONVENTION OF EDISON ILLUMINATING COMPANIES.

FULL REPORT OF THE PROCEEDINGS AT NIAGARA FALLS LAST WEEK.

The importance of occasional Conventions of those engaged in modern electrical enterprises can hardly be overestimated. Meetings of the telephone managers inaugurated early in the history of that business suggested gatherings of those whom the electric light industry had brought into this field of work. It is now four years since a few representatives of constructing firms and of the parent organization held a somewhat informal session and organized as "The Association of Edison Illuminating Companies." Arrangements were speedily made for semi-annual sessions, which have since been held in February and August of each year, until at the last meeting at Kansas City the by-laws were modified so that hereafter annual sessions will be held in the month of August. The tenth semi-annual Convention was appointed to meet at the International Hotel, Niagara Falls, August 13th, and their deliberations opened at that place at 2 o'clock P. M. last Tuesday, Mr. John I. Beggs, of the New York Illuminating Co., who has for the past three years presided, being in the Chair.

Mr. Beggs said in opening:

"It should be a matter of mutual gratification to the delegates on meeting so far from the scenes of the individual interests of most of the members to find so good a representation of the Edison industry of the country. In modifying our methods of procedure last February by arranging for the holding of annual, instead of semi-annual, sessions as heretofore, it was considered that a decided advantage would be gained in the comprehensive character of the deliberations, and that a better attendance would undoubtedly be secured by fixing upon a locality which in itself was central and possessed such natural attractions as would make it pleasant as a place of summer entertainment.

"We are, therefore, here to-day with the purpose of prolonging the sessions of this Convention if necessary beyond the usual limits of time allowed, and it is particularly the intention of the Chair to give the greatest latitude in discussions in order that no opportunity may arise for a feeling on the part of any of the delegates that the subjects which may come up for debate have not been adequately considered.

"Inasmuch as a year will elapse before another Convention, and particularly in view of the fact that since our last meeting important changes, anticipated for many months, have been consummated in the consolidation of the executive and manufacturing branches of the parent company, it seems to me particularly desirable that our proceedings at this time shall be reported with more than ordinary care and minuteness. Owing to a change in the character of his duties which have always been numerous and arduous, the gentleman who has for three years acted as secretary of the Association, has felt compelled to tender his resignation, which was received some weeks ago to take effect at this time. Anticipating the importance of this occasion I have, with the approval of the Executive Committee, requested Mr. W. J. Jenks, of the parent company, to make provision for the proper recording of the doings of the Association and act as secretary until the election of officers, which is one of the first items of business on our schedule.

"It is a matter of gratification to every member that we have with us the leading executive officers of the new Edison General Electric Co., together with Mr. E. H. Johnson, of the Edison Electric Light Co., who is here to acquaint us with the progress of the patent litigation."

The following members presented their credentials and were admitted to the floor of the opening session:

Edison General Electric Co., J. H. Herrick, Vice-President; Edison Electric Light Co., E. H. Johnson, President; J. H. McClement, Comptroller; W. J. Jenks and Charles Wirt, Technical Department; United Edison Manufacturing Co., H. Ward Leonard, Gen. Mgr.; Edison Machine Works, Samuel Insull, Gen. Mgr.; Montgomery Waddell, Philip Seubel, James F. Kelly, New York Agency; Edison Lamp Co., John W. Howell, F. Jackson, Charles A. Gundaker; Edison Laboratory, A. E. Kennelly, Wilson S. Howell; John I. Beggs, V.P. and Gen. Mgr. Edison Electric Illuminating Co., of New York; A. L. Smith, Prest. Edison Electric Light Co., of Appleton, Wis.; A. F. Walker, Supt. Edison Electric Light Co., Grand Rapids, Mich.; John I. Beggs, V.P. and Gen. Mgr. Edison Electric Illuminating Co., of New York; A. L. Smith, Prest. Edison Electric Light Co., of Appleton, Wis.; A. F. Walker, Supt. Edison Electric Light Co., Grand Rapids, Mich.; Maurice Hooper, Supt. Edison Electric Light Co., West Chester, Pa.; W. M. Brock, Genl. Mgr., E. E. Ill. Co., Paterson, N. J.; S. R. Mumford, Director and Treas., E. E. L. Co., Detroit, Mich.; Hoyt Post, Director and Atty., and C. P. Gilbert, Sec. and Mgr., also of the Detroit Co.; W. T. M. Mottram, State Agt., Dallas, Texas; A. F. Dow, Treas., E. E. Ill. Co., Fall River, Mass.; Thos. P. Merritt, Prest., E. E. Ill. Co., Reading, Pa.; C. L. Edgar, Genl. Supt., E. E. Ill. Co., Boston, Mass.; Leigh Carroll, Prest. and Genl. Mgr., E. E. Ill. Co., Birmingham, Ala.; Geo. H. Finn, Sec. and Treas., E. E. L. and P. Co., St. Paul, Minn.; E. L. Bemiss, Genl. Mgr., E. E. Ill. Co., New Orleans, La.; E. R. Weeks, Genl. Mgr., E. E. L. and P. Co., Kansas City, Mo.; Lewis Lusk, Prest. and Treas., E. E. L. Co., Antigo, Wis.; John R. Markle, Prest., Markle Engineering Co., Detroit, Mich.; Geo. W. Palmer, Jr., Mgr., McKeesport Light Co., McKeesport, Pa.; J. Edwin Giles, Supt., E. E. Ill. Co., Hazleton, Pa.; W. F. Wollin, Supt., E. E. Ill. Co., York, Pa.; C. J. Field, Genl. Mgr., E. E. Ill. Co., Brooklyn, N.Y.; Chris. Wustenfeld, Mgr., E. E. L. Co., Elgin, Ill.; J. B. Skehan, Treas., E. E. Ill. Co., N. Y. City; H. L. Brewster, Treas., E. E. Ill. Co., Rochester, N.Y.; J. L. Jamieson, Sec. and Treas., E. L. and P. Co., Mt. Holly, N. J.; L. Stieringer, Edison General Electric Co., New York; W. D. McQuesten, Contractor, New York.

Many of the delegates were accompanied by members of their families, and the sessions of the Convention were so arranged that a good opportunity was afforded for pleasure and recreation.

After the roll-call the president read the following letter:

"I hereby tender my resignation as secretary of the Association of Edison Illuminating Companies, the same to take effect, August 13th, 1889. I have served in this position for several years, and as my daily business in connection with electrical matters is constantly on the increase, I do not feel that I can in any way be considered as a candidate for the position in future. I therefore request that this resignation will be accepted. Yours truly,

"J. H. VAIL, Secretary."

On motion of Mr. Weeks, the Chair appointed a committee of three, consisting of Messrs. Jenks, McClement and Weeks to draft suitable resolutions expressing the sense of the Association for the faithful and efficient work of Mr. Vail in the past. They reported the following, which was unanimously adopted:

Whereas, Mr. J. H. Vail has found it necessary to withdraw from the office which he has filled during the past three years, therefore, be it

Resolved, That this Association has the fullest appreciation of its indebtedness to him for his able and conscientious services, and deeply regrets the loss which it suffers in accepting his resignation.

Resolved, That the secretary be instructed to forward a copy of this resolution to Mr. Vail.

The following were elected as officers for the ensuing year:

President, John I. Beggs, of New York; vice-president, C. P. Gilbert, of Detroit; secretary, W. J. Jenks, of New York; treasurer, Wilson S. Howell, of New Brunswick, N. J.; executive committee, A. L. Smith, Appleton, Wis., C. L. Edgar, Boston, Mass., Thos. P. Merritt, Reading, Pa., E. R. Weeks, Kansas City, Mo., C. J. Field, Brooklyn, N. Y., John I. Beggs, New York, *ex officio*.

This is the fourth successive annual election of Mr. Beggs as president and expresses more emphatically than any specific comments the efficiency of the service which he has rendered in this capacity.

THE REORGANIZED PARENT COMPANY.

Mr. Edward H. Johnson, being introduced by the chairman, spoke as follows:

"I think it is perhaps wise just at this moment to make a statement as to why Mr. Herrick is here.

"You are all aware, of course, of the fact that up to the present time the officers of the Edison Electric Light Co. have had to create the interests you represent without money of their own, and in fact have gone into the field simply on the merit of what they had to present. They have created this industry in a very wide field as the geographical distribution of your stations plainly indicates—in fact, have established the Edison business on a permanent basis. But it has been recognized during all that time that had the Edison Electric Light Co. been organized on a different plan, in fact been organized with capital of its own to be used for the purpose of establishing these industries, much greater progress would have been made and we should to-day have five or six hundred representatives here instead of this number. That fact, together with the other equally important one that the company had made all the money that it did secure from the sale of machines and patent appliances, decided the management to consolidate the many interests, thereby enabling them to show that a dividend could be earned, and also to enable them to conduct the business of construction and operation with capital of their own.

"About a year ago we started in for the purpose of bringing about that revolution in

(*Continued on page* 9.)

Telephonic News

⁂ Telegraphic communication has been established between San Diego, Cal., and Lakeside.

⁂ A new telephone line between Midville, Ga., and Swainsboro has just been completed.

⁂ Major Handbury, United States engineer, has called for bids for the construction of a telegraph line from Fort Stevens, near Portland, Ore., to the lighthouse on Tillamook rock. There will be 25 miles of land line, and 18,000 feet of cable.

⁂ The Western Union Telegraph Company has just completed a direct line between Manistee, Mich., and Chicago, with a repeating instrument at Grand Rapids. Hereafter the telegraph office will be open from 7 A. M. till midnight daily during the season of navigation.

⁂ Watertown, N. Y., is canvassing the advantages of a metallic telephone circuit between that city and Syracuse. It would cost $6,000. It is reported that the Central New York Telephone and Telegraph Company has agreed to build the circuit, provided a certain amount of business is guaranteed for two years.

⁂ George N. Seymour has left Stillwater, Minn., for Venezuela in the interest of capitalists, of which ex-Senator Sabin is president. Mr. Seymour will report upon the state of the country and its resources, and this report will have much to do with the acceptance of propositions made by the government to give the syndicate the exclusive right to build and run railways, establish telephone and telegraph lines and put in electric plants.

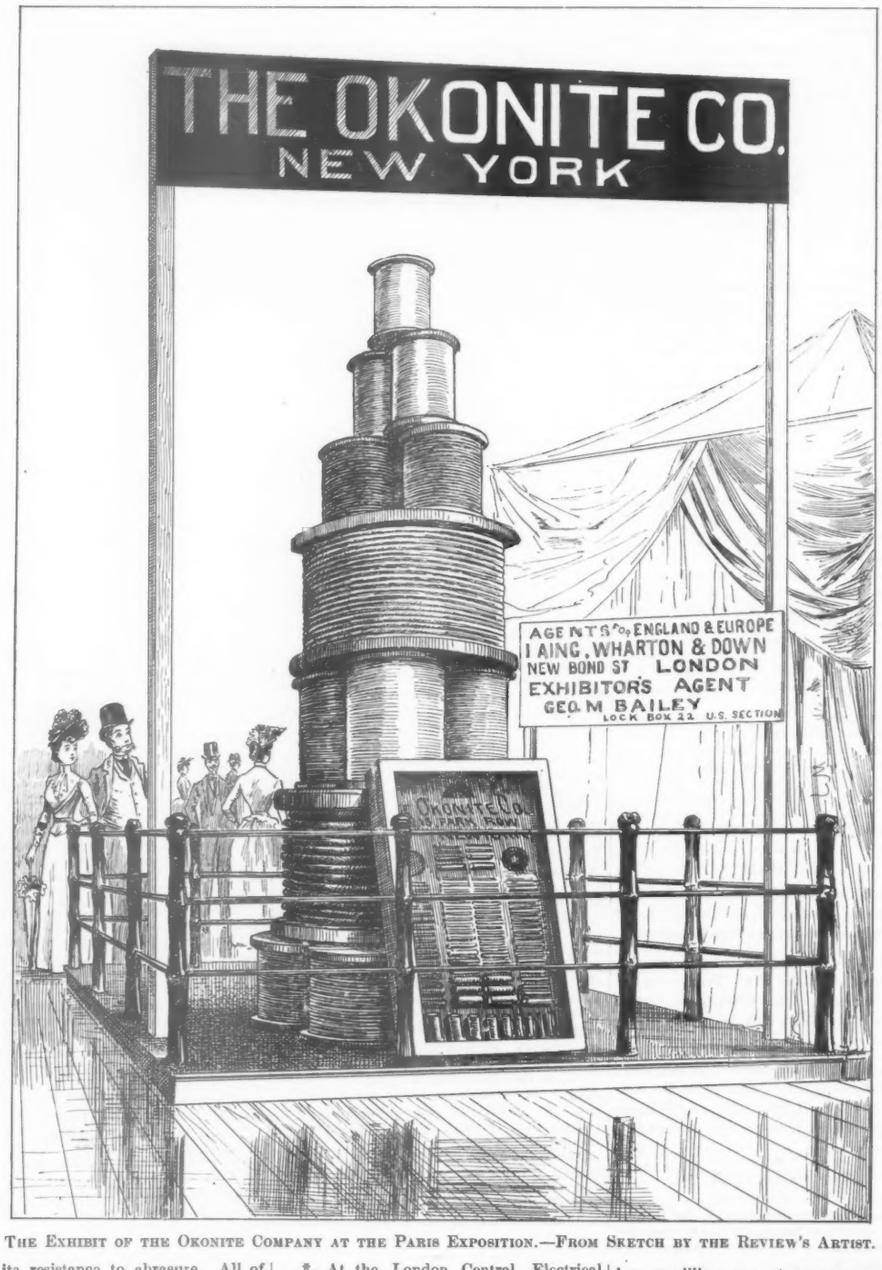
⁂ It is stated again that a company is being formed in St. Louis, Mo., to introduce the writing telegraph machines; that it is proposed to operate them on the telephone system, having a central office connecting with all the private or public instruments. If a business man wants to hold a conversation with a customer or friend, he pulls a little lever, which rings a bell at the central office. He then writes down on his plate the number he desires, the connection is made, and he proceeds to write down his message, which is immediately reproduced in the same hand writing at the other end. If the party the message is addressed to is in he answers in the same way, and the conversation can be carried on indefinitely. The questions and answers being all in writing, they can be filed away for future reference. When the party called up is not in, the message is ready for him on his return to the office, perhaps.

⁂ When the telephone was introduced into England eight companies were formed, each to work a separate district. Only three of these have been prosperous—the United Company, which serves London; the Lancashire and Cheshire, which serve the counties so named; and the National, which supplies Scotland, the North of England and a part of Ireland. Some time ago these companies decided to amalgamate for the purpose of better connecting the large towns and to develop the telephone system generally. But the postmaster-general refused to license the new company which it was proposed to start. Then the United and the Lancashire and Cheshire agreed to sell their business to the National, and the sale is being carried out. The postmaster-general, however, objects, and it is probable that he will decide to buy up the telephone in 1891, when he has the option to do so. Recently the Duke of Marlborough proposed in the house of lords to appoint a joint committee of both houses of parliament to consider the matter, and the prime minister expressed his readiness to agree to the proposal; but finally it was decided to postpone the appointment until the beginning of next session.

An Interesting Wire Exhibit at the Paris Exposition.

Visitors in the United States industrial section of the Paris Exposition can see, from any point in the big building, the tall pyramid made of reels of insulated wire from the Okonite Company, 18 Park Row, New York. It is the finest exhibit of its kind in the whole Exposition. In seeking an award for the merits of Okonite, the manufacturers have asked the French jury, which is composed of expert electricians, to make thorough tests of its insulating qualities, also for tenacity and toughness of the compound, also as to the maintenance of its good qualities under extremes of heat or cold, and to its resistance to abrasure. All of these claims will undoubtedly be examined by the jury of award.

The exhibit also includes a full line of Manson and Okonite tape, also the wiring of the American Bell Telephone Company's exhibit and the Western Electric Company's exhibit, which is done with Okonite wire.



THE EXHIBIT OF THE OKONITE COMPANY AT THE PARIS EXPOSITION.—FROM SKETCH BY THE REVIEW'S ARTIST.

⁂ The San Diego, Cal, and Cuyamaca road has received its first consignment of 1,000 poles, wire and insulators for the telegraph line along the new road.

⁂ Work on 12 miles of underground conduits has been begun in St. Louis for the reception of telephone, telegraph and electric light wires. The estimated cost is $230,000.

What a Great Showman Thinks of the Long Distance Telephone.

The following letter from Mr. P. T. Barnum was received by the Long Distance Company in this city, and is characteristic of the famous author:

WALDEMERE, BRIDGEPORT, CONN., Aug. 12, 1889.

American Telephone and Telegraph Company:

I consider your long distance telephone system a great, important and valuable addition to the marvellous development of the telegraph and local telephone. There seems to be nothing else desirable on earth to make us "equal to the angels" except the successful navigation of the air, and that I feel confident will very soon be accomplished.

P. T. BARNUM.

⁂ At the London Central Electrical Exhibition, recently, a highly interesting experiment was made with a current of 10,000 volts potential. One hundred 100-volt lamps, arranged in series, were fully incandesced, affording an ocular demonstration of the presence of the 10,000 volts. A pair of copper wires, with ends facing one another at a distance of half an inch, were then placed in the circuit, and all lamps were extinguished. The primary current being now turned on, the ends of the wires were immediately seen to glow with a Brush discharge, which steadily increased in brilliancy until, in about four or five seconds, the circuit was broken by the rupture of the safety fuse. The lights at the point did not attain any great degree of brilliancy, and bore no resemblance to an arc.

⁂ There are some hundreds, more or less, of smart young men in town who are impressed with the idea that there is nothing that the hard-worked and obliging young ladies at the telephone exchange like so well as flirting with idiots at the other end of the wire. The crushing rebukes at times administered to the conceited simpletons is as the flame of a candle to the moth, and they live only to tempt fate again. Some time ago there was one of these nice boys who worked in a fruit store across the street from the telephone exchange. He conceived a kind of long distance infatuation for the young lady who answered the 'phone in the store, and poured a stream of silly nothings into her unwilling ear at every opportunity. Finally she resolved to teach him a lesson. One day the young man was talking to the operator and expressed a violent desire to see her. With much assumed coyness she at length told him she would grant his request. She said if he would gaze at a certain window of the exchange at the hour of high noon she would appear. He would recognize her from the fact that she wore a red dress. The appointed time came, and the smitten youth planted himself in front of the store and gazed with all his eyes and soul at the window of the telephone exchange. Horrors! Instead of one there were five girls in red dresses smiling down upon him. It was too much and he fled. It was reported on good authority that the girl who put up the job was not one of the five.

State and Municipal Legislation.

THE REPORT OF MR. A. R. FOOTE, OF THE COMMITTEE ON LEGISLATION, TO THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

At the Niagara Falls Convention of the National Electric Light Association, Mr. Foote presented this report which was referred to the Executive Committee. It will be remembered that the following resolution was adopted at the preceding meeting:

Resolved, That a Committee on State and Municipal Legislation be appointed, consisting of one member from each State, to operate together, to secure such legislation in each State, as may be required, to enable municipalities to contract with incorporated companies to perform services for cities and their citizens, on the sound economical basis of securing to such companies an undivided demand, an unrestricted privilege, and a permanent investment.

Mr. Foote was made chairman of the committee with power to appoint other members. He reported the States represented by committeemen as follows:

California, George H. Roe; Colorado, C. H. Smith; Connecticut, John C. English; Florida, G. Stuart Smith; Georgia, H. E. W. Palmer; Illinois, B. E. Sunny; Indiana, John Caven; Kansas, L. A. Beebe; Kentucky, A. H. Barret; Louisiana, Samuel J. Hart; Maine, William R. Wood; Maryland, Arthur Steuart; Massachusetts, F. A. Gilbert; Michigan, J. E. Lockwood; Minnesota, S. S. Leonard; Missouri, Joseph A. Corby; New Hampshire, Alonzo Elliott; New Jersey, Henry W. Pope; New York, E. A. Mahar; North Carolina, D. A. Tompkins; North Dakota, Vincent S. Stone; Ohio, A. B. Foote; Oregon, P. F. Morey; Pennsylvania, A. J. De Camp; Rhode Island, Marsden J. Perry; South Carolina, George B. Edwards; Tennessee, Robert L. Morris; Texas, David Hall; Vermont, M. J. Francisco; West Virginia, John B. Garden; Wisconsin, S. S. Badger.

In this list of 42 States and the District of Columbia, there are but 13 blanks. Of the 30 members of the committee as now reported, 15 were members of the Association and 15 persons became members in accepting their appointment as a member of the committee. This history shows the successive steps taken in organizing the committee. It also shows that the committee, as now constituted, is the product of the co-operation of many devoted workers and clear-headed thinkers, who are giving life to the Association, by donating to it a part of their own.

As the initial step for the practical work of the committee, the following letter was addressed, July 19th, to the Secretary of State, of each State:

"*Dear Sir:* Will you kindly oblige me with a list of the bills, by their title only, affecting in any way the interests of the electric industry, which were introduced in the last session of the Legislature of your State, and the simple statement with each, 'Passed' or 'Failed?' I desire to report the list which you may furnish to the National Convention of the National Electric Light Association which will be held at Niagara Falls, August 6th, 7th and 8th. It will, therefore, be desirable to have the list mailed to me by August 1st. Thanking you in advance for the courtesy of your reply, I am very respectfully yours, (Signed)

"A. R. FOOTE,
"Chairman of the National Committee on State and Municipal Legislation of the National Electric Light Association."

In response to this request the following reports were received:

1. Alabama. "I have no knowledge of any bills introduced at the late session of the General Assembly on the subject of electric lights or other industries.
"J. D. BARRON, Sec'y of State."

2. Arkansas. "None introduced.
"J. H. SHINER, Chief Clerk,
"Sec'y's Office."

3. California. "I know of no bills introduced into the Legislature of this State that either 'passed' or 'failed' affecting in any way the electric industry.
"H. B. DAVIDSON, Dep. Sec'y of State."

4. Colorado. "H. B. No. 252, making appropriations for the maintenance and support of the State penitentiary for the years 1889 and 1890, and for other purposes, makes an appropriation for the establishment of an electric light plant within that institution. This is the only bill affecting the matter that I recollect. JAMES RICE, Sec'y of State."

5. Connecticut. R. I. Walsh, Secretary of State, sends a pamphlet, "Public Act of the State of Connecticut Passed January Session, 1889." But one act makes any reference to electric lighting, S. B. No. 4, chapter 9, page 5, an act relating to attachments and judgment liens.

6. Delaware. "An act was passed taxing telegraph companies. An act was passed granting a charter to charter a company to lay wires underground for a telegraph line in upper part of State. A bill was introduced to compel electric companies and telegraph companies to put wires underground in Wilmington—defeated.
"JOHN P. SAULSBURY, Sec'y of State."

7. District of Columbia. (No report requested.)

8. Florida.

9. Georgia.

10. Illinois. "H. B. No. 311, a bill for an act to authorize cities, incorporated towns and villages to construct gas and electric works—failed to pass. H. B. No. 352, a bill for an act authorizing cities, villages and incorporated towns to fix, establish and regulate rates to be charged, collected or received from electric light companies for light, heat and power failed to pass. These are the only bills that I discover that were introduced to the last General Assembly of this State. I. N. PIERSON, Sec'y of State."

11. Indiana.

12. Iowa.

13. Kansas. "I have no knowledge of any bills being introduced during the last session of our Legislature relating to the electric industry. WM. HIGGINS, Sec'y of State."

14. Kentucky.

15. Louisiana.

16. Maine. "There were no bills passed by the last Legislature affecting the electric industry. A few charters of electric light companies was the extent of legislation in that direction.
"ORAMANDAL SMITH, Sec'y of State."

17. Maryland.

18. Massachusetts.

19. Michigan. "In compliance with your request, I have examined the list of bills introduced during the recent session of the Legislature, and find but one bill on the subject. A bill to authorize the formation of lighting, heating and power companies—failed to pass.
"GILBERT R. OSMUN, Sec'y of State."

20. Minnesota.

21. Mississippi.

22. Missouri. "I enclose herewith copy of Section No. 952 of the law on corporation, which is the only legislation passed by our last General Assembly, affecting the electric industry. The same power is extended to all cities under their different classes.
"A. A. LESUEUR, Sec'y of State."

NOTE—This is an act relating to authority of municipality to contract with an incorporated company for lighting by gas or electricity or supply of water. Contracts may be made for 20 years.

23. Montana. (No report requested.)

24. Nebraska. "H. B. No. 75. An act authorizing any city of the second class in this State to establish, maintain, operate and control a system of electric lights, and to fix rates of charges for the use of lights, and to provide for the collection of such charges. Passed March 30, 1889. This is all.
"GILBERT L. LAWS, Sec'y of State."

25. Nevada. "But two electric bills were introduced during the last session of our Legislature. Both passed as follows: An act to authorize the board of State prison commissioners to erect electric lights on the State prison grounds. An act to authorize the lighting of the State capitol building and grounds by electricity.
"JOHN M. DORMER, Sec'y of State."

26. New Hampshire. "Our Legislature for this term is still in session. I am not aware of any actual or proposed legislation touching the electric industry.
"A. B. THOMPSON, Sec'y of State."

27. New Jersey. "I hand you by this mail a copy, in pamphlet form, of the laws enacted by the Legislature of this State at its late session. It will be impracticable for me to furnish you with a list of the bills introduced at the last session which affected the electric industry.
"HENRY C. KELSEY, Sec'y of State."

NOTE—In this pamphlet the following acts were printed: "An act requiring cable railroad companies, electric railroad companies and horse railroad companies to make annual returns to the State board of assessors. Chapter 208, page 96. An act concerning cities of this State, and to provide for properly and sufficiently lighting the streets and public places thereof. Chapter 297, page 137."

28. New York.

29. North Carolina. "Wm. L. Saunders, Secretary of State, sent a pamphlet of captions of the acts and resolutions of the General Assembly, passed at the session of 1889, with a synopsis of their contents."

NOTE—In this pamphlet there are printed seven acts, incorporating companies or extending the power of incorporated companies, for the purpose of making use of electric service; also, act 149, page 18, an act to empower gas companies to supply electricity for lighting and power. Resolution No. 18, page 82. Resolution in relation to the use of electric lights to be put in the Senate chamber and hall of House of Representatives.

30. North Dakota. "There were no laws introduced at our last session of the Legislature affecting in any way the electric industry.
"L. B. RICHARDSON, Secretary."

31. Ohio.

32. Oregon. "No legislation was offered during the last session affecting the electric industry.
"GEORGE W. MCBRIDE, Sec'y of State."

33. Pennsylvania. "Charles W. Stone, Secretary of the Commonwealth, sent a printed copy, entitled, No. 153. An act to amend an act, entitled, An act to provide for the incorporation and regulation of certain corporations, approved the 29th day of April, A. D. 1874, providing for the further incorporation and regulation of electric light, heat and power companies."

34. Rhode Island. "None had.
"SAMUEL H. CROSS, Sec'y of State."

35. South Carolina.

36. South Dakota. (No report requested.)

37. Tennessee.

38. Texas. "No bill relating to the electric industry was passed at the last session of the Legislature of this State.
"J. M. MOORE, Sec'y of State."

39. Vermont.

40. Virginia.

41. West Virginia. "S. B. No. 102. A bill authorizing the City of Wheeling to generate, distribute, supply and use electricity and gas. Did not pass.
"HENRY S. WALKER, Sec'y of State."

42. Wisconsin. "I hand you herewith printed copy of laws, passed during session of last Legislature of this State, relating to electric lighting. The enclosed were the only bills introduced.
"ERNST G. TIMME, Sec'y of State."

NOTE—The enclosures were: "No. 383. S. Chapter 282. An act to provide for increasing the facilities of the department of mechanic arts of the State University, and to establish courses in railway and electrical engineering there, and making an appropriation therefor. No. 293. S. Chapter 375. An act relating to electric light companies. To provide, by suitable insulation, return wires or other means against injury to persons or property, by leakage, escape or induction, of any and every current of electricity."

43. Washington. (No report requested.)

No. of States reporting, 26; No. of States making no report, 16; No. of States from which no report was requested, 4; total, 43.

In this connection, I wish to acknowledge the receipt of copies of bills from S. A. Duncan, of Pittsburgh; John B. Garden, of Wheeling; F. A. Gilbert, of Boston; B. E. Sunny, of Chicago, and Ferdinand A. Wyman, of Boston.

*** Charles G. Beebe, secretary and treasurer of the Chesapeake and Potomac Telephone Company, is reported to have said that when the new telephone service is established in Baltimore, that city will have one of the best telephone systems in the United States. The metallic circuit will be used exclusively. Conduits will be laid for drawing in cables. They will have a total capacity of one hundred and fifty 100-hundred wire cables; about 60 of these will be in immediate use. These cables will contain about 5,000 miles of wire. In the metallic circuit system each telephone has two separate wires twisted about each other. By this arrangement induction from neighboring wires is reduced to a minimum, and long distance telephoning is made possible. The long distance lines connecting Washington and Baltimore with Philadelphia, New York, Boston, Albany, Buffalo, Chicago and intervening cities, is being constructed on this plan, and when completed will enable persons in any of these cities to talk with any of the other cities using the ordinary telephones.

Italy Interested in the Phonograph.

Charles H. Wood, Vice-Consul-General to Rome, reports to the State department, July 29th, that Signor Enrico Copello, who formerly lived for many years in the United States, has purchased the right to sell the Edison phonograph in Italy. As a preliminary step to this enterprise, the Consul reports that Signor Copello visited Rome, bringing with him the first phonograph ever seen in the kingdom. It was exhibited before representatives of "The Associated Press," of the Senate and Chamber of Deputies, leading scientists, and King Humbert. The King dictated a congratulatory message of the phonograph to the inventor, and requested Signor Copello to carry to Queen Margaret, at Venice, a phonograph message. These exhibitions awakened great interest throughout the country, the vice-consul says, and the columns of the press are filled with handsome tributes to Mr. Edison and to the inventive genius of the American people generally.

The French Chamber of Deputies and the Telephones.

The French Chamber, in the interval between two pugilistic encounters, has passed the bill for the purchase of the Paris telephones by the State. Our French contemporary, the *Bulletin International de l'Electricité*, says: "There was nobody in the Chamber, neither on the right, nor on the left, nor in the center, to ask the government for explanations, or to induce the reporter of the commission to furnish the necessary information. The deputies, of all shades, certainly display an extraordinary indifference in anything and everything which is not personal abuse, exchange of invectives and scandalous revelations, with or without a game of fisticuffs."

The reason for purchase at this moment is roundly asserted to be the desire of the government to be masters of the telephonic service when the elections commence, and, "to obtain this end, what does it matter whether a few millions more or less are spent?" adds our contemporary.

It appears that nobody took the trouble to study the accounts presented by the commission, and in which the receipts alone were given, but not the expenditure. With the exception of two deputies, M. de la Bâtie and M. Dreyfus, the statements of the commission favorable to purchase seem to have been accepted without discussion. Amongst the arguments brought forward by M. Cochéry, the secretary of state for posts and telegraphs, in favor of government management figured in the first place the reduction of the rental. There is no mention of such a reduction in the report of the commission, and the Paris subscribers may as well give up all such pleasant illusions if they ever held them. The government will charge them the same price as the Société Générale des Téléphones, and it remains to be seen whether they will give them an equally good service. Fears are expressed that the government, by laying hands on the telephones, will have at their disposal a number of appointments, and will fill them with their political supporters; and not only that, but there will be more place-hunters than appointments, the latter will be increased in number, and instead of effecting a saving, a loss will accrue from the employment of too numerous a staff.

It is further alleged that any expectation of improved service by the introduction of improved methods and apparatus will be doomed to disappointment. And for the proof of this assertion, the adversaries of State purchase point to the telegraph service, where improved apparatus were only adopted years and years after having received practical recognition abroad. And they also point out that with a new industry, the appliances for which are exposed to incessant improvement, it is not in the interest of the State to search for the best, because they would have to pay for patents and royalties and incur expenses for which special provision would have to be made. It seems that the management of the Société Générale left much to be desired, but that the company, after all, spared no expense to give to their subscribers an efficient service, and also that the uncertainty about the action of the government has for some considerable time paralyzed the efforts of the company.

If we draw a parallel between the condition of telephonic affairs between France and this country we find at once that we need have no fear on the scope of indifference of Parliament to public expenditure. Whenever the English post office purchases the telephones, the terms proposed by that department will be closely scrutinized, and we may safely predict that a mere statement of receipts, without going into the question of expenditure, would be a suicidal act on the part of the postmaster-general. Nor need we fear that any government would use the telephone appointments for political ends; abuses of patronage are the inherent curse of Republican governments, and of very rare occurrence, indeed, in this country.

There only remains the one objection urged by the advocates of private enterprise, namely, that State administration is slow in adopting improved apparatus and improved methods. With regard to this objection, we point to the management of the English telegraphs, just as our contemporary does to that of the French. And here we find that we fortunately have some men at the head of this department who are fully alive to the importance of new inventions in the field of applied electricity, who are themselves enthusiastic workers in this field, and who have proved over and over again that they have the public interest at heart.

* * A certificate has been filed of the consolidation of the Citizens' Street Railway Company, of Decatur, Ill., with the Citizens' Electric Street Railway Company.

* * The phonograph is to be used in the teaching of elocution in St. Joseph's Academy, at Greensburg, Pa. It magnifies defects of enunciation, and, at a recent test, a pupil honestly tried to repudiate as not his own a speech it had recorded. He could not believe he was so faulty.

* * The directors of the Union Depot and Mound City Railroad Companies, known as the Scullin lines, held meetings at their respective offices recently. The capital stock of the Union Depot Company was increased from $400,000 to $1,200,000, and it was decided to change the motive power of the road from horse-power to electricity. The Mound City Company voted to increase their capital stock from $125,000 to $1,000,000, and decided to change the motive power to electricity. Bonds will be issued on each road to the amount of the capital stock, for the purpose of providing means to make the change.

* * The efficiency of the electric system for the Colerain avenue road, just completed for the Cincinnati, Ohio, Street Railway Company, by the Thomson-Houston Electric Company, was put to a practical test recently. Only one of the three dynamos were in use at the time of the test, operated by a single Ball engine of 200 horse-power. This was sufficient to light the power-house and furnish power on the road for ordinary uses. The company will not open the road to the public at once—at least not until all the motor cars have been tested on the road and found to work satisfactorily with competent men at the motors, which will be in a short time.

* * For several weeks past a report has been in circulation to the effect that the Little Rock (Ark.) Electric Railway had been purchased by a syndicate of Philadelphia capitalists. As if confirming this report, the president of that road came East about two weeks since. He neither affirms nor denies the report of the sale. He admits that negotiations are pending, and if the sale takes place, with it goes Cunningham's Lake, a body of clear water a few miles west of the city, and several large tracts of suburban land. It is impossible to obtain the particulars of the deal, but enough can be seen on the surface to show that it is one of great magnitude.

* * One of the first electric street railways in this country, the Washington Street, Asylum and Park Railway, of Binghamton, N. Y., has recently had its entire equipment changed in order to meet the latest and most approved ideas of electric railway science. The first equipment was installed about two years ago, and the changes which are being made illustrate the advances which have been accomplished in electric railway science, and they show the difference between the ideas which were prevalent two years ago and the leading ideas as illustrated in the motor appliances of to-day. The motor cab, which occupied the front of the car under the old style of electric railway, will be entirely dispensed with, and the motors will be placed underneath the cars, as in all the modern electric railways. The overhead overrunning trolley and the method of carrying all the current over the track on a single conductor have been abandoned for the latest Sprague methods in this case. The motive power, also, will be under the more complete control of the driver, and all degrees of speed in both directions are obtainable by movements of a single switch, so that the car can be propelled either backwards or forwards with equal ease and rapidity.

Success of the Storage Battery Cars on the Fourth and Madison Avenues, New York.

Theory in electric traction seems to be a thing of the past. Never has practice followed so closely on the heels of theory as in the case of the application of electricity as a motive power for the propulsion of street cars. While two years ago street railroad men were justly skeptical as to the success of electricity as a motive power in its then undeveloped form, they to-day seem to vie with one another to be the first in the field to adopt this new and attractive means of transit. In 1886 there were but seven roads operating cars by means of electric power, while to-day there are 109 who are either operating or have roads already in course of construction. It is stated that an independently propelled car is preferable for the carrying of passengers in the city streets, to a system dependent on a central source of supply. It has simply been a question to prove that such system could be applied to the propulsion of tram cars so as to be absolutely reliable and economical. The storage of electricity seems to be the only means of obtaining such a result, and it has been the labor of many years to bring this system to its present state of perfection. The first of the standard cars of the Julien Electric Traction Company, operating on the Fourth and Madison Avenue lines in New York City—No. 7—ran over 6,000 miles and carried over 80,000 passengers, we are informed, without costing one dollar for repairs.

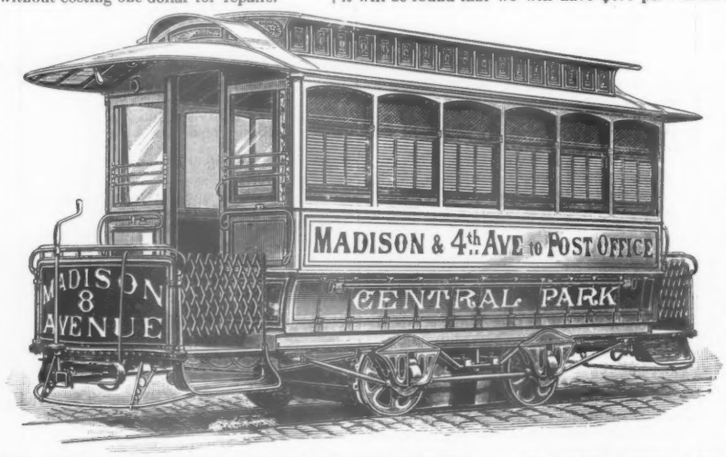


FIG. 1.—THE NEW STORAGE BATTERY CARS—JULIEN SYSTEM—ON THE FOURTH AVENUE LINE, NEW YORK.

Having proved that a storage battery car could be built that would be reliable, the Julien Company began the construction of 30 cars at the works of the John Stephenson Company, based on the experience gained by car No. 7; the first of these cars—No. 8—was placed on the road June 22d, and on Wednesday, August 8th, car No. 17, the last of the first group of 10, was placed in service and have since then run continuously in regular passenger service, to the great satisfaction of the company and of the officials of the Fourth and Madison Avenue road.

The performance of these cars is particularly creditable, when it is considered that they are sent out between horse cars, and are dependent entirely on their self contained energy, and have never failed to return to the station by their own power. They are placed entirely in the hands of green drivers, who, however, seem to take pride in being promoted from a horse car driver to a position approaching an engineer. The road on which these cars are operated is, in every way, unsuited to the operation of a mechanical system; the track, switches and frogs are in many cases of an old pattern and are very severely worn from the heavy trucking of a large city. The cars are run from the car stables, and owing to a lack of room, many of the accessories of an electric system are lacking. The actual operation of these 10 cars marks a new era in street car traction, as they solve the problem of storage battery traction, and it is certainly to be hoped that, at a not very great distant period, this means of locomotion will be very thoroughly adopted in the streets of New York and elswhere. Its advantages are too well known to dilate upon; it is simply a question of proving their practicability and economy. Their reliability is proven beyond a question by the record of No. 7, and also by the performance of the 10 cars now in service. The absolute cost of operating cannot, of course, be given as the result of experience to be sufficiently reliable, until the system has been run as a system, for at least a much longer time. It is a question if there is a company running an electric road in this country to-day that can more than surmise what it costs them to operate, owing to the uncertainty of the depreciation of motors and overhead construction work. There is not the least doubt in the minds of the officials of the Fourth Avenue line, however, that the storage battery system will prove cheaper than horse traction. It is found on this road that it requires less than 12 horse power hours to make a round trip of 12 miles and at the rate at which current can be produced, varying from 1½ to 2 cents per horse power hour, it will be seen that for a car day of 75 miles, the actual current required for the propelling of the car will cost but $1.50 at the most. The other items of the cost of motive power, attendance at the station, and depreciation can be calculated by allowing the positive plates of the batteries a life of one year, and the negatives two years, and allowing 10 per cent. per annum depreciation on the motors, regulators, etc., it will be found that we will have $700 per car per year, or a total of $3.40 per car per day, and adding attendance, say $4, as against $6.50 for horse traction on the same line. When cars are turned out in large quantities the cost of battery will necessarily be reduced and the above figures we may expect to see fall below this estimate. By allowing the battery a life of but six months, the Julien Company estimate that they can operate the system at a less cost than horse traction, which, with the advantages it presents, would be sufficient to insure its general adoption.

The car illustrated in the accompanying cut is one of 10 now operating on the Fourth Avenue line and is a 16-foot body mounted on an independent rigid truck with a six-foot wheel base, on which are placed two 10 horse-power motors. The truck is entirely independent of the car body and may be removed at any time. The weight of the car, mounted on its truck, with motors, gearing and battery in position, is between six and seven tons. The motors are geared direct, one to each axle, and are readily accessible from the car floor to trap doors. The battery consists of 108 cells which are placed in six trays of nine each on each side of the car; these trays are pushed into the car through the outside panels under the seats. This battery has a total capacity of about 35 electrical horse-power hours. The cars, as operated on the Fourth Avenue line, are geared for a speed of from 9 to 10 miles an hour on the level, though they can be run much faster for suburban service, when not operated between horse cars. Each car requires from 6½ to 8 horse-power for generating machinery according to the number of cars in operation. Cars are operated from either end by a regulator. The movable handle is applied by the driver, and no one is better able to run the car than a horse car driver, owing to his knowledge of the brakes. Putting on and shutting off of the power is learned thoroughly in a few trips.

The regulator used on these cars is a very beautiful feature, the power being applied by different groupings of the accumulators, thus the variation in speed from the start to 10 miles an hour is so gradual as to be imperceptible. A powerful brake is used on all cars which in case of emergency can be supplemented by the reversal of the motors from the regulator, and the car stopped when going at full speed within one-half its length. Five 16 candle power incandescent lamps are used to light the car, and a warning gong is also sounded by current from the battery. The truck employed in these cars is, to some extent, a departure in electric railway construction, being made of wood, which in addition to deadening the sound of operation of motors and gearing takes up all vibration and prevents the loosening of parts which is found to be so common in cable and other mechanical cars employing iron trucks. The body is supported on rubber cushions which not only renders their riding most delightful, but prevents all strain on the car body proper in suddenly stopping or in the rounding of curves. Since these cars have been placed in service, they have never missed but one trip (caused by a broken wheel flange), and there has not been a cent spent upon them for repairs of any kind.

When storage batteries were first introduced for the propulsion of street cars, the question of the handling and charging of the batteries was considered one of grave importance. It will be seen that each car, requiring 216 accumulators, measuring six inches square and seven inches high, would, in a large installation, be an item of perhaps vital consideration, should not the proper means be at hand for their charging and manipulation. One of the most ingenious and attractive features in the Julien system is their battery shifting device which is illustrated in cuts 2 and 3. The car runs into the station between two elevators 16 feet long, composed of two shelves, the lower one containing the charged set, while the upper one is used to receive the discharged set, when withdrawn from the car. When the fresh set has been put in place through the outside panels of the car, the car goes out, and the elevators are raised up between a series of racks into which the discharged batteries are placed and a fresh set is lowered, which operation is repeated with each car. The batteries, which are in six trays on each side of the car, make automatic contact with the regulator the moment they are pushed in position in the car, and they in the same manner make contact with the dynamo, as soon as they are placed on the shelves. These elevators are run by stationary motors, and the entire change from the time the car enters the station until it is again on the road occupies but three minutes; and while the battery is being changed the regulators and motors are examined. These racks, with motors, etc., occupy a space of but 24x7 feet on each side of the car or 336 square feet, which represents the stall room of 135 to 150 horses or 6,000 square feet. This item of saving the floor space is one of great importance in large cities, where land is at a premium.

The best proof of the favor with which the officials of the Fourth Avenue road view the operation of these new standard cars, is the fact that they have recently placed an additional order with the Julien Company for a second group of 10 cars, which will doubtless be followed by the entire equipment of the road. Two cars have just been sent to Providence, which will be operated by the Union Passenger Railway there, and the Pullman Palace Car Company are building 12 bodies, a number of which will be placed in service on the horse car line in Pullman, Illinois.

Annual Convention of Edison Illuminating Companies.

(*Continued from page 5.*)

the Edison business which is now fully accomplished. The Edison Company is to-day in the position that some of its competitors have been for some time past—namely, standing ready to go into the field to compete for business upon a commercial basis with the sinews of war behind it.

"In the reorganization of the Edison business most of the competent executive officers, engineers and technical men of all descriptions, have been retained. Other men have come in who represent new capital, instilling new blood into the enterprise, and altogether the company is now in a position to deal with the questions of competition created by parties who have appropriated and are using (pending the decisions of the courts) methods of which the genius of Mr. Edison has made us proprietors."

Mr. J. H. Herrick, vice-president of the Edison General Electric Company and president of the United Edison Mfg. Company, was then introduced. He said:

"Mr. President and gentlemen: It is a source of great satisfaction, and also a source of great embarrassment to meet these gentlemen who are so intelligent and so well informed in this business. To me this is a new platform. I come upon it anxious to learn the principles of electricity and to profit by the work of this Convention, but primarily I presume some idea of the future policy of the company from a purely business point of view is expected.

"It is very much easier to lay out a plan of campaign than to carry it into effect. In giving you a sketch of what is proposed, of course such a sketch will be subject to such modifications as the future may render either just or desirable. The growing commercial value of the Edison system of electric lighting attracted the attention and careful consideration of capitalists. An investigation of the validity of the patents, the probability of sustaining them and thereby insuring a practical monopoly of incandescent lighting, together with the impression that a consolidation of the Edison interests would thereby produce economy in its management, its general expenses, etc., led certain gentlemen to endeavor to bring about a consolidation of the various companies, which after several months of negotiation was finally accomplished. The Edison General Electric Company is now practically the owner of all of the companies covering the Edison system of incandescent lighting. The relation which this company will now hold toward the illuminating companies, will, as I understand it, be divested to a very great extent of the parental feature which has been admirably sustained in the past. It is better it seems to me that the parental position should be succeeded by a purely commercial one.

"It is hoped that the relation of the illuminating companies and the patrons and believers in the Edison system throughout the country will be wholly and purely on a friendly commercial basis. Believing that to be for your best interest, and the best interest of the General Company, we have decided to maintain it for the mutual advantage of all of us.

"The organization of the company has been made in this way; the General Company may be said to take the place of the Edison Light Company, with the additional advantage of controlling all existing interests.

"To take charge of the executive management of all the departments of the business, another company has been organized, the United Edison Manufacturing Company, under the control of the Edison General Electric Company.

"Its revenue will ultimately go into the treasury of the general company. It will be conducted by gentlemen who are familiar with the exigencies of the business and its wants. The patent litigation I believe it is intended shall be prosecuted with more vigor than in the past, and it is hoped that instead of being partly on the defensive we may become wholly aggressive litigants, and that we may not only sustain the fundamental patents, but also the large number of subsidiary patents which shall put us in a position to assert the right we believe to be ours and which right we believe will in time be sustained by the courts of justice.

"As to the commercial aspect: A very large saving will be made in the expense of the company's management. That will enable the company to sell its goods at a more reasonable rate. It is the intention, in so far as the commercial necessity of the case requires, to reduce prices on all electrical apparatus. One of the very earliest efforts of the company was to get what was earnestly requested and freely debated at the Kansas City meeting, a reduction of the price of lamps. It is also expected that while this reduction as applied to isolated work has been large, a certain proper reduction shall be made to the illuminating companies, as it is the effort and intention of the General Company to place our central station plants in a position to compete with any lamp in the market. I am credibly informed and believe that a further advance in the efficiency of the lamp will be made, and that thus the Edison lamp will be the cheapest as well as the best in the market.

"In regard to its isolated business: It is believed that the general system for the construction and installation of isolated plants can be more effectually and economically operated under one general organization. The company will therefore seek to take charge of that business throughout the country and do its own work of installation. We have been led to take this step from the fact that frequently installations were made which were defective and which injured the station in that locality as well as the system generally. This we seek to avoid, and are determined to do the work in the best possible manner at the lowest possible price. By this arrangement we believe that the illuminating companies will be the gainers, as arrangements will be made that will be entirely satisfactory as an equivalent for that which has heretofore been secured by the local companies who have installed these plants themselves. In a word, the general idea is to consult and harmonize all the interests connected with the Edison system, and by cheapening the cost of production, benefit the general public as well as the illuminating companies.

"I am very much pleased to have been able to meet the gentlemen of this Association, and trust that everything which has been proposed may be consummated to your benefit as well as to that of the General Company, and that the pleasant associations which I have formed at this Convention will long continue."

The relations of the parent organization and its licensees and agencies, were discussed by John I. Beggs, of New York, who introduced several important questions as to the future policy of the newly organized General Company, and pointed to numerous examples of the practical outcome of past methods of dealing with local organization which in his view should serve to shape future negotiations. The matter was taken up by Messrs. Johnson, McClement, Leonard, Edgar, Herrick, Post, Mottram, Smith, Carroll, Markle and others. The discussion was very animated and was finally settled by the assurance of Mr. Herrick that in the arrangement of the general policy all available information would be considered and all practical ideas given proper consideration, to the end that the greatest mutual advantage would be secured.

Mr. E. H. Johnson made a deeply interesting statement of the condition of the litigation to establish the validity of the Edison fundamental patents. The exact present status of the filament, fibrous carbon, feeder, three-wire and other important patents, was taken up in detail, and a comprehensive idea conveyed to the Association of the determined spirit shown by the Edison Electric Light Company (which still maintains its organization for this purpose) in forcing these questions towards ultimate and speedy decision. It was specially brought out that in three of the most important suits the records and arguments are in the hands of the judges, and decisions are expected at any moment. These include the suit entered by the Sawyer-Man Company against the McKeesport (Pa.) Light Company, in which the burden of the defence is assumed by the Edison parent organization.

The number of papers submitted to the Convention was unusually large and valuable. For reasons which have influenced the Association in restricting the attendance upon its meeting to the legitimate membership, much of the practical material embodied in these papers is not given to the public. Their general character and scope will, however, be indicated by outlines and extracts.

"THE HEATING OF CONDUCTORS BY ELECTRIC CURRENTS," BY PROF. A. E. KENNELLY.

Mr. Kennelly stated in presenting his paper to the Association: Not very long ago the Edison parent company desired to know more fully than it had the means of knowing at that time, the exact conditions of safety as regards the carrying capacity of conductors used in electric light work and the transmission of electrical energy for power purposes. The subject was first suggested specifically to the standardizing bureau by Capt. William Brophy, of the New England Insurance Exchange, who pointed out certain inaccuracies and omissions in the existing tables used by the various electric companies in wiring buildings and forming the foundation of the rules of the Exchange under which these companies are operating.

It is, of course, a very important subject, and when the insurance people applied to the Edison Electric Light Company for information, it was unable to give full and complete details of what sizes of wire should be considered perfectly safe for any given

(*Continued on page 10.*)

FIG. 3.—VIEW OF METHOD OF LOADING STREET CAR WITH STORAGE BATTERIES.

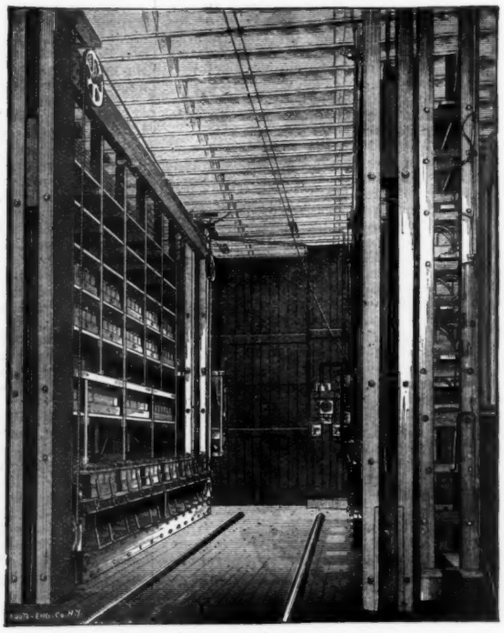


FIG. 2.—METHOD OF ARRANGING BATTERIES FOR CAR LOADING.

ELECTRIC LIGHT NEWS

—— The Amherst Gas Co. have voted to put in an electric light plant, and to use gas engines to drive the dynamos.

—— The Alpena, Mich., Electric Light Company have declared a semi-annual dividend of six per cent., being one per cent. more than usual.

—— There is now a "Dynamodermic Institute of Paris," where the professors offer to smooth out wrinkles by "electrolysis." The electricity revivifies the skin and makes it young again.

—— The electric light plant introduced at the Wakefield Rattan Works last fall has proved a great success, so much so that the company is now busily engaged putting in 500 more lights.

—— The regular quarterly dividend of 1½ per cent. on Westinghouse Electric stock has been declared and is payable August 26. Transfer books will be closed from August 15 to 26 inclusive.

—— The Committee on Science and Arts of the Franklin Institute, of Philadelphia, has recommended the award of the Scott legacy medal and premium to Dr. W. Leigh Burton for his electric heater.

—— The Greenfield (Mass.) Electric Light and Power Co. have voted to increase the capital stock from $15,000 to $30,000, in order to attend to the large increase of business. One new engine and one new dynamo will be put in.

—— The lighting of the new *Daily World* building now in course of erection has been secured by the isolated lighting department of the Westinghouse Electric Company. The plant will be a large one, consisting of 3,600 lights, and will be one of the most complete ever installed.

—— Electric light excursions are among the novelties of summer resort amusements, especially at the Thousand Islands. A correspondent says: The sights revealed when the powerful search light is directed toward inhabited portions of the islands are always interesting and sometimes startling.

—— A committee in Leeds, England, having giving the matter of incandescent lighting a thorough investigation has concluded that a great improvement in the filaments is necessary, for, although made to burn 1,000 hours, the average life of the carbon is between 800 and 900 hours only.

—— There will soon be some lively bidding for the contemplated improvements in the street railway service at Minneapolis. The Edison Company has already made a proposition to furnish electric power at the rate of $2.70 per day for each car. Another company proposes to put in an electrical plant and not ask a cent unless it proves entirely satisfactory.

—— The Winthrop (Me.) Electric Light Company has just been organized, and includes some of the heaviest business men in the place. It will have a capital stock of $10,000. They will put bonds upon the market immediately and begin operations at once should the stock be quickly taken. All business places and many private residences will be illuminated by the company.

—— The commissioners of the District of Columbia have signed a contract with the Electric Light, Heat and Power Company of Washington, operating under the Westinghouse Electric Company of Pittsburgh, to light certain streets with incandescent lights. This was done in spite of the opposition of the Washington Gas Light Company and the United States Electric Light Company, which claim a monopoly of street lighting for the district. All three companies will probably appeal to Congress.

current under any given conditions in household work. Thereupon the Light Company had carried out at Mr. Edison's laboratory, in Orange, a series of experiments which have resulted in putting the company in possession of more full information upon this and kindred points than is to be found anywhere else in the electrical world at this moment.

In these experiments we adopted the course of putting 24 wires of different sizes in actual panelling. Various currents were then sent through these wires, the highest being 300 amperes, which was considered a maximum for general interior work. Observations were made as to the temperature resulting from these various currents. The highest temperature reached was 100° C. or about 180° F. above that of the surrounding air of the room. This was reached by number 26 B. W. G. wire with nine amperes. As the wires grew bigger and bigger the temperature lowered correspondingly with the same current until with the largest wire only 40° C. was reached with 300 amperes.

By taking these results we can find what temperature will be reached by any current on a given size of wire under ordinary conditions.

The important question arises as to what is considered a safe temperature. You might allow a wire in your cellar to rise 150° F. above that of the surrounding air which might be 40°, that would be in all 190°. You could not allow at the ceiling of your parlor where there might be an existing temperature of 100°, 150° more on top of that without a source of danger.

The paper was not read by Mr. Kennelly but filed for action by the Company. It was very lengthy and contained valuable diagrams, curves and tables and was considered a very valuable addition to the company's technical literature. Discussion on the points brought out was participated in by Messrs. Johnson, Wirt, Field, Insull, Mottram, Merritt and Carroll.

The next paper of importance was by Mr. Leigh Carroll, of Birmingham, Alabama, entitled

"THE MAXIMUM EFFICIENCY OF INCANDESCENT LAMPS FOR CENTRAL STATION WORK."

The scope of this paper may be inferred from the following extract:

"This question, so far as it has to do with the Edison lamp, is one which has already received such exhaustive treatment by Mr. John W. Howell in his paper before the Institute of Electrical Engineers, April 14, 1888, and later by the Edison Lamp Company in a paper over Mr. Edison's signature read at the last meeting of this Association, that there would seem to be little left to discuss."

An interested listener to Mr. Edison's paper at the last Convention and to the discussion that followed it, my attention was particularly called to the apparent unwillingness of the Convention to accept the results reached by Mr. Howell and Mr. Edison, though the experimental and theoretical determinations of Mr. Howell were substantiated by the mathematical determinations of Mr. F. E. Jackson, and these same results were found by Mr. Edison's investigation to be reached in practice.

Those who are familiar with Mr. Howell's paper will recollect the law as stated by him to be as follows: "The point of maximum efficiency is reached when the lamp bills are about 15 per cent. of the total operating expenses of the station." It is the correctness of this law as applied to central stations that we propose now to consider.

Following out Mr. Howell's line of thought we find the total cost of operating lamps to be made up of two parts:

1. The cost of current.
2. The cost of the lamps.

This current cost is made up of every expense incurred in producing the current, and properly includes materials and supplies consumed, labor, taxes, insurance, salaries, rent, interest, and all fixed charges of every description.

If, however, we examine these items we shall find that they consist of two distinct classes:

1. Those that vary with the amount of current produced.

2. Those that do not, but are practically constant without regard to the current output.

Thus among those expenses that are practically constant we will find all fixed charges, such as interest, rent, insurance, taxes; also nearly, if not quite, all the labor and salaries, since a station must always be ready to handle business.

The variable items are supplies such as coal, water, oils, etc., and minor expenses. This latter class varies in practically a direct proportion to the current output.

The breakage varies in conformity with the law obtained by Mr. Howell, that the life of the lamp in hours is equal to the sixth power of its efficiency expressed in Watts per candle. Using Mr. Howell's notation, and modifying it to conform to the divisions of cost as given above, we would have:

T = total cost = C + L where C = current cost, L = lamp cost, and where $C = C^k + C^v$, when C^k = constant current expenses, and C^v = variable current expenses. Or, $T = C^k + C^v + L$. Also, $T^v = C^v + L$, or total variable cost = variable current cost + lamp cost.

To illustrate how the ratio between the constant and variable parts of the current cost will affect the total current cost under varying current output we will take two cases of opposite character:

1. A. Constant expenses large. B. Variable expenses small.

2. A. Constant expenses small. B. Variable expenses large.

A central station belonging to the first class will be one where power is very cheap, or costs nothing at all,—owns its water power for instance,—whose plant is well managed, which uses but little oil, etc., and has but few repairs. Under these conditions the total cost will vary but slightly whether there is one lamp in a circuit or a thousand. But while the total current cost varied but little, the cost, per lamp, or horse power per hour, will vary largely with the current output.

Thus, suppose 2,000 horse-power hours per month cost $400, of which $360 are for constant expenses and $40 are for variable expenses. Here the current cost per horse-power hour is 20 cents. If, however, we increase the output to 4,000 horse-power hours the expense becomes $440, of which $360 are for constant expense and $80 for variable. Our current now costs only 11 cents per horse-power hour.

A station in the second of the above classes will be one where the fixed charges are small, salaries low, and labor cheap. But fuel and water are high, or perhaps power is rented at a fixed price per horse-power hour so that the cost increases directly with the output.

Thus reversing our figures about, suppose 2,000 horse-power hours per month to cost $400, of which $40 are for labor, salaries, taxes, etc., while $360 goes to pay for fuel, water, etc. The cost would be as before 20 cents per horse-power hour.

Increasing the output now to 4,000 horse-power hours we would have total cost $760, of which $40 would be for constant expenses, while $720 would go to variable expenses. In this case the cost per horse-power hour would be 19 cents, as against 11 cents above, a widely different result.

Hence care must be taken in dealing with the question of cost per horse-power hour under varying output of current, to examine and to divide it into its component constant and variable elements and base our determinations upon the relative value of each.

This paper was also long and exhaustive. A spirited discussion, participated in by Messrs. Howell, Jackson, McClement, Wirt, Beggs and Smith followed the reading, illustrating the difficulties found in the arrangement of an equitable basis for the calculation of conditions which should govern in central station practice. It was desired that Mr. John W. Howell should take time to consider the subject carefully and if necessary formulate a modification of his original paper which would reduce it to a practical rule for the use of managers of central stations.

One of the most interesting papers to a majority of the delegates was a paper dealing with many practical questions of every-day importance to managers of both large and small central stations, though primarily addressed to the latter class. It was entitled

"PROMINENT PERPLEXITIES WITH STATION MANAGEMENT,"

presented by Wilson S. Howell, who has for the past three years been employed in travelling from one station to another in response to calls for systematic inspection and advice as to the equalization of pressures, enlargement of business, reinforcement of conductors and kindred subjects requiring thorough and practical knowledge of the details of the business.

Among the numerous points touched upon was that of the use of 110 volt motors on three-wire systems as a fruitful source of trouble, bad balance and excessive losses in certain areas; questionable practices in the interior wiring of buildings; improper placing and uses of equalizers; the proper detection and corrrection of weaknesses; and particularly practical knowledge of all details of the system which managers should possess. The discussion was limited in time and comprehensiveness by the statement of Mr. Herrick that a department of inspections intended to follow up the detail of all points of this character is now in process of organization, and will be made one of the features of the methods pursued by the new management.

FUEL GAS.

On the subject of some of the advantages obtainable by a system of Electric Light and Fuel Gas, Mr. John R. Markle, president of the Markle Engineering Company, of Detroit, read a very careful and suggestive paper which was received with great interest by the Association.

Mr. Markle's paper will doubtless be printed and circulated among the Edison central station people. An animated discussion immediately resulted, and called out Messrs. Edgar, Field, Johnson, Beggs, Gilbert, Mottram, Leonard and Insull, culminating in the appointment of a committee for the further investigation of the proposition, to report to the executive committee for such action as in their judgment might be deemed immediately advisable. This committee was composed of Messrs. Markle, Field and Edgar, with the president.

HIGH POTENTIALS AS AN ADJUNCT.

Mr. Gilbert, of Detroit, offered the following resolution:

Resolved, That the Association respectfully call to the attention of the Edison General Electric Company, the difficulties under which local companies are now laboring in consequence of the lack of:

1. An efficient and inexpensive arc light system.

2. An arc lamp which can be economically operated on the three-wire system.

3. A flexible method of enlarging the territory which can be profitably covered from their stations, for domestic lighting by higher pressures and consequently less outlay of copper than that involved by the three wire method.

We earnestly appeal to the parent organization to supply these deficiencies.

In the discussion which followed it was brought out that this question had been carefully considered by the parent company, who had instructed Mr. Jenks to prepare a statement as to the various methods by which the Edison stations may be thus enlarged. A number of extracts from this paper are given below:

The address of Sir William Thomson, as president of the physical section of the British Association in 1882, contained this memorable passage: "Nothing above 200 volts on any account ever should be admitted into a ship or house or other place where safeguards cannot be made absolutely and forever trustworthy against all possibility of accident." This opinion accords with what Mr. Edison has always maintained—that in the long run every system will fail which does not (for domestic service) use a low pressure current.

Bearing in mind therefore this underlying idea as a text, the purpose of the few methods to be described will readily be understood. They are merely attachments or excresences on the comprehensive plan represented by the three-wire system; makeshifts having special uses or fields.

1. *The Double Three-Wire.*—This system possesses the paramount advantage of using only one-fourth of the copper of the regular system. With this arrangement four or six lamps can be put on a two-wire service, and with a reasonable outlay of copper in mains the drop falls to almost nothing. The same motors can be used with simply a change in the constant. The extreme pressure brought into a building is 440 volts, which with a direct current is within the limits of entire safety to human life.

2. *The 500 Volt Three-wire.*—The Capital Electric Light Motor and Gas Company, of Boise City, Idaho, report under date of July 31st, that the long distance three wire high pressure system, started July 3d, 1887, while it has worked satisfactorily so far as its electrical action is concerned, is not a feasible method for domestic lighting.

The people have been enthusiastic as to the operation of their plant from the first, and are now proposing to install two No. 12 dynamos, specially wound for 275 volts each, to replace the present machines, and changing the system so as to have two 110 volt lamps in series. In this way they expect to do residence lighting with 20 per cent. drop in the line.

This three-wire plan using 500 volts on each side is entirely practicable for store lighting at long distances.

3. *The Direct Current Transformer.*—In all previous cases we have simply used a specially wound dynamo to get the potential required. There are two varieties of these in prospect. In the one now operated we have a motor and dynamo combined in one, the armature being provided with two independent sets of coils, a commutator at each end and no pulley. The high pressure current of 1,000 to 1,200 volts from a municipal dynamo is received on one commutator, and the low pressure current of 100 to 125 volts sent out from the other. The sizes proposed are No. 3, 60 amperes: No. 6, 120 amperes; No. 10, 200 amperes; No. 16, 320 amperes; No. 32, 640 amperes. This machine is regulated from the primary generator. The system is now ready for adoption by any company needing its advantages.

4. *The Alternating Transformer.*—It is well known to the central station managers that the parent company secured some time ago the rights for a desirable alternating converter system. The fact that it has not yet been put out bears witness to the steadfastness with which they have adhered to the policy of refusing to place on the market anything that they could not fully commend to the public as in every way desirable and safe to handle. It is only where peculiar conditions, such as extraordinarily cheap power can be found, that customers will probably require such a system after considering the advantages and economy of the 440 volt three-wire and the direct current transformer method. The admissions of the warmest friends of the alternating systems at the recent National Convention of the terrible danger attending their use, as exemplified by the horrible tortures which have been undergone by innocent victims, and the selection by the State of this current (of the standard 1,000 volt potential) as an embodiment of the most deadly force known to science for the execution of criminals, all point to a very limited application of this form of apparatus. But the demand for an alternating system being recognized, it is now proposed to offer one of the most efficient type at its actual value as being dangerous and inefficient at best, but procurable on demand.

It is especially noteworthy that the dangers attending its use will shortly influence legislation, as a matter of protection to life and property.

We are only interested in noting the contrast between this and the previous system in the flexibility. As the alternating converter has no moving parts it requires no attention, and can be operated where power is cheap with an approach to economy in small units, under such restrictions as have already been and may in future be imposed.

5.—*The Municipal for Streets, Depots, etc.*—Tunnels, halls, stores and streets have been successfully lighted by this system for some time. Now a new field which has for a long time been talked of shows itself in lighting the train house of the Central Railroad of New Jersey, which is an immense structure 500 feet long and 200 feet wide. There are 12 tracks and six platforms. Over each platform are 16 three-light clusters which make a full circuit, starting at the dynamo building 800 feet away and ending at a common return for all circuits. Should anything happen to this return wire there is a second one provided which may be connected.

The advantage of this system in railroad lighting is its simplicity and small cost. Buildings of this kind are generally very high. Lamps are best supported by long iron pendants; the municipal wires being small, may also be installed at a very small cost.

6.—*The Municipal with Individual Control.*—Apparatus has recently been devised and is now offered to the public by which simple switches, out of the reach of the consumer, may be operated by cords to cut in or out individual lamps on municipal interior circuits, a compensating resistance being introduced either at the lamp or the central station, as ordered. Small constant load motors, as for example ventilating fans, may thus be run very economically.

7. *Arc Lamps on Edison Circuits.*—Weeks and months of the time of many inventors have been spent in endeavoring to adopt the arc lamp to a circuit of constant pressure. The light emitted by any lamp using ordinary carbons, depends primarily upon: 1. The energy expended. 2. The detail of construction as affecting proper radiation of the light produced.

All the arc lamps in general use on Edison stations in the United States to-day are connected with a resistance coil, or with incandescent lamps, so that about 65 volts out of 110 is wasted. Only clock feed lamps can be used successfully even in this way. In Boston several "Simplex" and other styles are so operated. Aside from the waste of energy, there is in all these cases the item of a large rheostat and its attendant heat, and to a certain extent danger from fire. Harrisburgh has some 40 or 50 such lamps, and it is probable that 500 might be counted throughout the country.

The advantages to be gained by such a lamp, could one be so made as to be economical in power consumed and attendance necessary, are several.

1. Saving of special station room, engines, dynamos and circuits.

2. Substitution of low pressure conductors (which can be run in mouldings or concealed within the walls of buildings) for the dangerous pressures and necessarily exposed wiring of series lines.

3. Safety and convenience in handling of lamps and trimming by the customer, where with a series circuit the experienced trimmer is a necessity.

4. Avoidance of the dislike of Edison customers for duplication of inside wiring where a few arc lamps are demanded.

5. Ability of the company to meter the current of arc lamps as well as incandescents, thus avoiding the presentation of both a meter and a contract bill.

It is not surprising that in view of these important considerations, persistent efforts have been made to operate two lamps in series. Four foreign lamps, which have come here with some promise of success, have been carefully tested.

The advent of a successful parallel lamp would, of course, go far towards solving the question which has always confronted the Edison station manager: "How shall I meet the demand for larger lights, prevent the rise of rival interests which, if suffered to begin operations with an arc system, are absolutely certain to compete with me sooner

or later in the incandescent field, and secure to my own company such profits as I see others making in supplying arc lamps?"

It is to be hoped that somebody will speedily present this successful parallel lamp, and whoever does this at a reasonable price will find a market for hundreds and probably thousands.

8. *Arc (Series) Systems.*—The field cannot be entirely covered by the first mentioned method. It costs too much for copper to distribute energy for a general street lighting system at low pressure. There are also many stores outside the economical limit of a three-wire system which demand arc service. What should the station manager care what his customer does with the current furnished, whether he heats an Edison filament, or runs a sewing machine motor, or burns a Brush, or a Sperry, or a Ball arc lamp, so long as he pays a profitable price for it?

Many of us believe that the Edison Municipal System give the best diffusion of light, and really the most valuable street service, but if the station manager cannot convince his City Council of this, it is evidently only an unprofitable sentimentalism which will refuse to furnish what is demanded. Whether or not in the perfect social and commercial science of the coming millenium the arc lamp will have a place, is less important for us to speculate than whether we can make some money out of it while it is in fashion.

It is a pleasure to be able to say that under the new plan the Edison General Electric Company will soon be prepared, in cases where a comprehensive series system is needed, either to furnish or to definitely recommend and endorse some efficient and economical arc system, and if desirable superintend its installation.

In the purchase of real estate and the erection of stations, the possibilities of this kind of business should never be overlooked.

Arc street circuits up to several miles in length can be attached to an Edison municipal dynamo.

Discussion on this subject culminated in the assurance by Mr. Herrick that an active interest had already been shown by the parent company in the general question, and that immediate steps, tending to the production of all these systems and enabling the Edison station manager or agent to supply on its merits any system demanded by the public, will soon be consummated.

MUTUAL INSURANCE OF EDISON CENTRAL STATIONS.

At the session held at Nantasket a year ago a committee was appointed to investigate and report upon the feasibility of a plan for the combination of Edison Central Station Companies for mutual insurance protection. This action was rendered desirable because of the unwarrantable discrimination against electric light station risks generally, resulting from the lack of information possessed by the active officials of insurance companies.

At the Kansas City meeting in February last the committee reported that the Edison stations from whom they had received replies to their request for co-operation in this respect did not represent a sufficient capitalization or a sufficient total risk to warrant the formation of a company exclusively for this purpose. They were given further time with instructions to learn what arrangements could be made with existing mutual or stock companies. Their report presented at this session is given in full, with the exception of the individual correspondence referred to.

The committee on the mutual plan of insurance of central stations respectfully submit the following report:

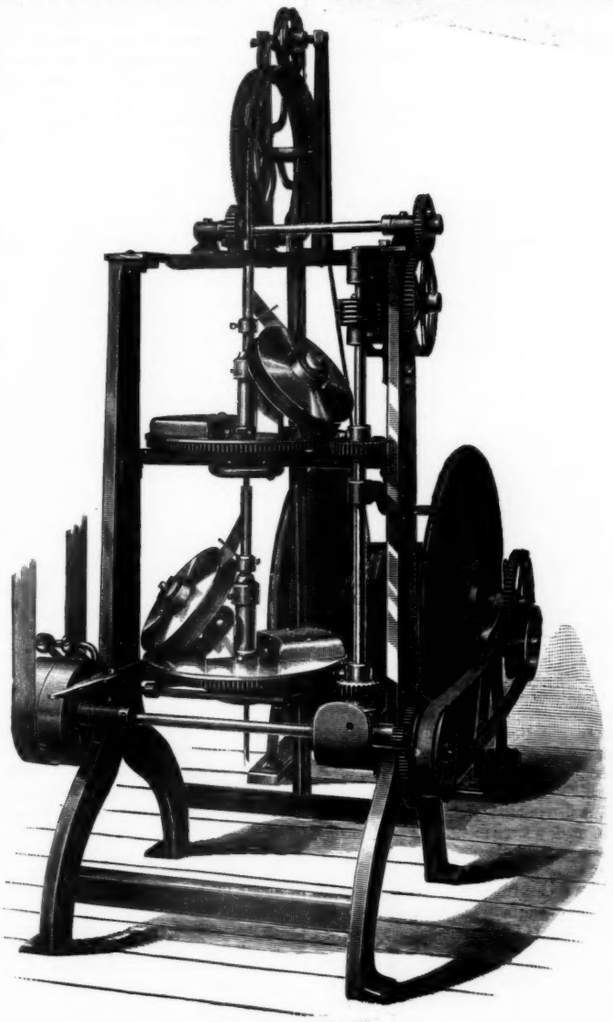
We have conferred with representatives of the Prudential Fire Association, the Manhattan Mutual Fire Insurance Company, both of New York, and the Mercantile Mutual Fire Insurance Company of Providence, R. I. It is worthy of note that the president of the last-named company is the gentleman who has since the Fall River fire (until within two months) strenuously refused to negotiate with the Edison companies of New England. He has, however, lately found that the stock companies making up the New England Insurance Exchange have, after careful investigation, been satisfied to solicit business of this kind on the basis of 75c. per $100 for what is called "standard" risk, carefully outlined in their schedule issued after consultation with your committee in April last, since the date of our last report. This schedule is appended as a part of this report.

We have found by those repeated and painstaking interviews that some action on the part of this Association is almost indispensable to any general or profitable connection with those insurance companies which cover the best mill risks in the most careful and painstaking manner, so far as intelligent and rigid inspections are concerned, at the actual cost or a close approximation to cost of legitimate management. This will be best illustrated by reading a letter from the president, speaking for the Associated Mill Mutuals of New England, the organization which under the general oversight of that authority on these questions, Edward Atkinson, has attained a prominent position as representing an ideal system.

We have not pushed this matter with single companies for the reason that it is here shown that some assurance of some sort of uniformity in the risks must be received before we can get the benefit of low mutual rates. We must get a sufficient number of illuminating companies to aggree to transfer their policies to mutual companies so that a minimum volume of business and corresponding premiums shall be assured them, and that these illuminating companies will take all reasonable pains to set their houses in order. This can only be properly done as the result of such a system of inspection as is now proposed by the parent company.

We therefore recommend:

1. That during this session as many central station officials as possible agree in writing to transfer certain portions of their insurance to mutual companies at one per cent. provided an inspector sent by the parent company to all stations can report that our stations are so far safe in their construction and operation that the combined risks thus placed shall not be imperiled by the extra hazard of any of the risks included.



NEW TAPING MACHINE.

2. That the Association earnestly requests that the co-operation of the parent company in carrying out this plan, as being the only authority really capable at present of thus in a sense standing sponsor for the companies thus to be benefited and as being jointly interested with the Association in bringing about this increase economy, and above all, this increased safety to our station and thus reliability to our income.

3. That this subject, thus shown to be only partially exhausted, be placed in the hands of a proper committee of three members in or near New York. That this committee be entrusted with the responsibility of keeping the members of the Association frequently and carefully informed of the progress of their investigation and of any change in insurance rates or opportunity to secure favorable arrangements with any companies, and that the expenses of the committee in these or any other directions which they may unitedly consider it wise to investigate be paid, as heretofore, by the Association.

Respectfully submitted, for the Committee. W. J. JENKS, Secretary.

The committee entrusted with this work, being larger than is now necessary to carry it to completion, was discharged, and the following (being members of the old committee) were appointed in accordance with the recommendation of the report: C. L. Edgar, Boston; Thomas P. Morritt, Reading, Pa.; W. J. Jenks, New York.

THE MOTOR QUESTION.

The motor department of central station business was taken up by Mr. Beggs with a recitation of his experience in New York. He referred pointedly to the injury done illuminating companies by the action of agents who simply aim to make a commission on sales without taking into account at all the disadvantages saddled upon stations who are obliged in furnishing current to meet many perplexities and even severe losses caused by the operation of motors thus disposed of. He dwelt especially on the fact, which he said was apparent to every station master, that many of these agents are evidently acting at variance with the policy of the companies they represent, and that such short-sighted methods will consequently in the long run prove to the disadvantage of those companies which allow them to earn large commissions by indefinite and irresponsible assertions. He gave a general idea of the prices adopted by the New York and Harrisburgh companies under varying conditions, emphasizing the impossibility of fixing any well defined schedule of rates for particular class of work. He was very careful to have it understood that while he made contracts for the supply of electricity to motors operating under all circumstances, he also made it an invariable rule to check the current of each motor by an Edison chemical meter. The aggregate motor business in the three New York central stations was shown to be upwards of 500 horse power. Among the many novel applications of the current for the purpose of producing energy is the use of the motor for the blowing of church organs, the motor taking the place of a salaried man in the choir. A great saving is made to the church officials and the experience of churches has been most gratifying.

Mr. Edgar, of Boston, summarized the experience there is in this line by showing that at present 700 horse power is being supplied to motors, an addition of 150 horse power having been made since the first of June. As in the case of the New York Company Mr. Edgar is very careful to check the contract system (wherever it is found necessary to adopt it) by the chemical meter.

STEREOPTICON ENTERTAINMENT.

On Tuesday evening a large number of invited guests, with the delegates and their ladies, assembled in the parlors of the hotel and were entertained by a stereopticon talk given by Mr. W. J. Jenks, embracing several features of interest to practical electricians and officers of the illuminating companies. Among them was a minute synopsis of the specifications and claims of the Edison fundamental patents, having particular reference to those now in litigation, and to the Sawyer-Man fibrous carbon patent. The matter of lighting protection to station buildings and overhead lines was carefully reviewed and illustrated, specific directions being outlined for the protection of the station itself, the numerous experiments upon several forms of arresters for three-wire and municipal circuits being shown. The entertainment closed with a large number of historical slides illustrative of the earliest stages of Edison's laboratory work and the present manufacturing industries.

Philip Seubel, of the machine works, presented an interesting paper descriptive of a method devised by him for the location of grounds in underground tube systems.

IMPROVED CHEMICAL METER.

Statements made at the Convention by Messrs. Jenks and Wirt of the parent company show that since the date of the last session the improvements which have been for more than a year in progress are now practically accomplished, and that drawings for the new pattern of the chemical meter are now in the hands of Bergmann & Company, who are prepared to receive orders.

Many of the details embodied in these changes have already been reported in print. The construction, as well as the methods of operation of the meter, have been greatly simplified, so that now it will register accurately for the current supplied to one lamp or to a thousand, according to the size installed, and the possible error is reduced to one-fourth its former value. This is combined with a very decided saving in the running expense of a meter department, and in the simplicity of the entire system. A revision of the "Book of Instructions" to meter men is now being made, and within a short time large numbers of the new form will be in operation in Brooklyn, New York City, Buenos Ayres, S. A., and many other points of almost as great importance. The cost of changing from the old to the new will not be large, and station managers will shortly be informed of the exact plans of the new parts, which may be applied by them without the necessity of sending their meters to the factory.

As an instrument for measuring current delivered to electrical railways the Edison motor has shown itself reliable and accurate.

INTERIOR ELECTRICAL CONDUITS.

Mr. E. H. Johnson gave an account of the system of equipping interiors with conductors now being exploited by the Interior Electrical Conduit Company of which he is president. This is a method of placing non-conducting and non-inflammable tubes throughout a building, and installing conductors after the work of building construction has been completed. It was shown that the cost is less than that of any other method of doing concealed work, with many advantages in way of convenience, readiness of reinforcement and safety.

NEXT MEETING.

The executive committee recommended that the session of 1890 be held at Sault Ste. Marie in Northern Michigan. After some debate it was decided that the vicinity of Minneapolis or St. Paul was preferable, and the exact location was left to the executive committee who will notify the Association in due time.

Including the evening stereopticon entertainment, the Convention held six sessions, the final adjournment being made on Thursday at 5.30 P.M.

New Taping Machines.

We present this week another specialty just brought out by the New England Butt Company, of Providence, R. I., U. S. A. This taping machine is designed for taping cables and is arranged to lay on a tape in various ways and of different lays. The reels are 10¼ inch heads, one of which is removable to enable the roll of tape to be readily put in, they are adjustable to any lay required and to any width of tape from ¼ to 1½ inch and regulated by a simple tension. The guide tube through which the tape passes has an ingenious arrangement of tension, quickly operated and effective if required, and is made to sizes of cables to be covered. The machine as illustrated is set to tape two layers in opposite directions; it can be adjusted to lay them both in the same direction, or additional reels can be put on to get four lays all in the same direction, or in opposite directions. The machine is very simple in construction, is built strong and durable and turns off work rapidly.

KINDRED INTERESTS

The European Electric Welding Company, of Portland, Me., will increase its capital stock $100,000, making the total capital stock $1,600,000.

The Electrical Supply Company, Chicago, is now making a specialty of furnishing fuse wire, having arranged to manfacture it in large quantities. The company is sending to all inquirers a price list, giving number of amperes each wire is expected to carry.

The Eclipse Wind Engine Company has just completed and shipped to the Excelsior Electric Light Company, St. Joseph, Mo., a full equipment of shafting, floor stands, friction pulleys, couplings, etc., and also filled a large order for specialties to go to the Electric Railway and Power Company, Seattle, W. T.

The Pond Engineering Company will furnish the capitol building, Austin, Texas, a 70 horse-power Armington & Sims engine, and a 70 horse-power boiler, to be used in running the electric lighting station. They are furnishing the Western Engineering Company, of Omaha, Neb., with some Ireson leather link belting, and the Pine Bluff, Ark., Water, Light and Power Company, with a vertical boiler and a Tracy oil filter. Their sales of books on "Engineering Topics" for the past week has been very large.

The Mather Electric Company has issued a handsome and complete new catalogue with descriptions of and advantages claimed for its lighting system, together with lists of the users of the system and comprehensive description of the plants. The company sold for the year ending March 1, 1889, about 63,000 incandescent lights. This year up to the first of May, 1889, about 9,000 lights were sold. Two incandescent lamps were recently received from the Forest Paper Company, of Yarmouthville, Me., which had been used 12,168 and 11,500 hours, respectively, and at the time of withdrawal from service were still good. The first figures seem to break the record in the use of incandescent lamps.

The Thomson-Houston International Electric Co.—This company has moved into new and commodious quarters in another part of the Hathaway building, 620 Atlantic avenue, Boston, a change necessitated by the increase of business since the former removal in December. The main office is large and airy, with plenty of light. It is finished in oak and occupied by the five bookkeepers and assistants. Mr. Geo. W. Davenport, the manager of the company and Mr. S. C. Peck, have their private offices adjoining. These are also finished in oak and fitted with exquisite English electroliers in novel designs. A smaller inner office shows some beautiful electric lighting fixtures and effects, the designs being reproductions of the famous Marlboro' House fittings. The International Company has received word from Carderias, Cuba, that the plant recently installed there was started, August 5th, by Mr. J. H. Waterman, and that everything worked perfectly and to the entire satisfaction of the purchasers.

* * At a recent meeting of the Brunswick (Me.) Electric Street Railroad Company, the following officers were chosen: President, Weston Thompson; secretary and treasurer, F. H. Wilson; directors, Weston Thompson, J. P. Winchell, A. F. Gerald, C. B. Story, F. C. Webb, William M. Pennell, F. H. Wilson, of Brunswick, and A. F. Gerald, of Fairfield. The capital stock is $25,000. The storage battery system will be used on the road, which is expected to be in operation by the middle of October.

A New Style of Belt Fastening.

We illustrate herewith a new style of belt fastening, which is being manufactured and placed upon the market by the Bristol Manufacturing Company, of Waterbury, Conn., which, on account of its resemblance in appearance and elasticity to the ordinary leather lacing, is called by them the "Steel belt lacing."

The Bristol fastening consists of a continuous zigzag strip of steel, having spurs alternating on opposite sides of a longitudinal center line, and bent at right angles, as shown by Fig. 1, in which the fastening is represented as placed on the ends of a belt about

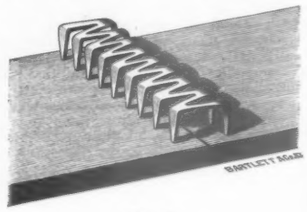


FIG. 1.

to be joined. The spurs having been driven through the belt and clinched on the inside, the finished joint will appear as represented in Fig. 2.

The spurs should be driven through upon a piece of soft wood; then by laying the smooth side of the joint upon the face of the pulley or any convenient piece of iron, the points may be clinched.

It should be observed that the zigzag or lace-like form of the blank of this fastening renders it elastic and flexible, so that, when applied, it readily accommodates itself to the crown of the pulley or the twist of a crossed belt.

As the fastening is narrow, a slack belt can be taken up a very small amount if desired. They are made of various lengths up to three

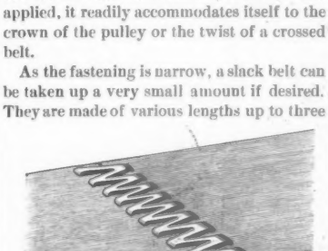


FIG. 2.—BRISTOL'S BELT FASTENING.

inches, to correspond to the standard widths of belting, and are put up in packages of 100 inches each. For extra wide belts, two or more fastenings may be used.

The fastening was devised by Prof. W. H. Bristol, of Stevens Institute of Technology, who, in determining the proper proportions for it, made a large number of experimental fastenings, put them into pieces of belts, and pulled them apart. He thus determined the best possible relation between the width of steel spurs and the spaces between them, and arrived at the best proportions generally.

* * A special meeting of the stockholders of the Mt. Adams and Eden Park Inclined Railway Company, of Cincinnati, was held at the office of the corporation on the 21st inst., for the consideration of the question of increasing the capital stock by the issuance of an additional $200,000 of common stock, to be used by the Directory in the equipment of the Eden Park line with electricity, and "for such other improvements as the Board may deem expedient."

A New Emancipation.

[From the Toledo *Blade*.]

Jim Robinson is telling a story around Toledo which is worth printing. Of course, it is about electric street railways, but that doesn't hurt it. It seems that a northern company recently put in an electric road in Nashville, Tenn., and an old darky was showing it to his wife. "Look at it! Look at it!" he said. "Bress the Lord, these Yankees are great people. Twenty-five yeahs ago dey come down heah and freed the niggah, and now dey come down and free de mule."

Electricity on the Dinner Table.

A Brazilian inventor, to whom a patent has just been issued, proposes to remedy the annoyance suffered from the shaking of dishes upon the tables on shipboard by means of an electrical contrivance. His idea is to use an electro-magnetic device. To the under side of the dishes will be attached small pieces of iron and on the table will be laid long strips of soft iron to which wires leading to a battery will be connected. The use of this electro-magnetic appliance will not mar the appearance of the tables, and certainly it should prove effective.

The Telephote.

A Frenchman, M. Courtonne, announces that he will shortly make public a discovery he has made which will enable people to use their eyes in the same way that the telephone adds to the ordinary powers of the ear—that is, as the telephone enables us to here sounds from a long distance, the telephote will enable us to see far-off objects. M. Courtonne maintains that his invention will permit of the transmission on a wire of luminous vibrations, through any kind of obstacle, for thousands of miles. The user of the telephote, it is assumed, can see whatever is visible from the instrument at the other end of the wire as easily as if he were on the spot. There is nothing improbable in this. If sound waves can be transmitted over a wire, there is no reason, except the want of knowledge, why light waves cannot also be transmitted. The latter vibrations are very much shorter than the former, but in one case, as in the other, it is merely vibration which has to be trented. Possibly the time will come when, so far as seeing objects are concerned, one can make a tour of Europe without going out of his own house.

The Musical World.

THE PHONOGRAPH TO THE RESCUE.

The phonograph continues to creep ahead in musical fields. The recent American concert given by Mr. Frank Van der Stucken at the Paris Exposition, will be handed down to posterity in the shape of little wax cylinders.

Now many vocalists are beginning by its aid to hear themselves as others hear them, and to realize—as Emma Abbott did in Pittsburgh—how different their voices sound from what they imagined them to be. If it be true, as claimed, that all manner of lapses in tune, time phrasing or pronunciation are revealed to the singer himself by having his voice bounce back to him, as it were, what a great boon to suffering humanity the invention will be.

Instead of the effective, but ungracious, method of hissing a poor singer, what a poetic penalty it would be to grind out between acts at the dressing room door a faithful reproduction of what its inmate had just inflicted upon the audience. And the much-abused press critic; just fancy how, when the big, irate tenor comes around to argue the point, he can turn his little crank and annihilate the self-convicted blunderer with a triumphant, "There! I told you so!"

Is Electricity Subject to Duty?

Solicitor Hepburn, of the Treasury Department at Washington, has been called upon to decide an interesting question in regard to the introduction into the United States of electricity generated in a foreign country. It seems that an association of gentlemen has established an electrical plant at Niagara Falls on the Canadian side, and propose to extend their wires to Buffalo for purposes of illumination, etc. Before doing so, they desire to know whether the electrical current thus transmitted into the United States would be subject to duty or other tax. It is believed that the solicitor will evade the question by informing the persons interested that it is contrary to the rules of the office to answer hypothetical questions of this character.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING AUGUST 13, 1889.

408,740 Filament for incandescent electric lamps; Adolph Oppermann, Chicago, Ill.

408,753 408,754 Electric motor for street cars; Wilbur S. Salisbury, Chicago, Ill.

408,762 Fire alarm box; John Speicher, Jersey City, N. J.

408,768 Dynamo electric machine; Jean T. Van Gestul, New York, N. Y.

408,778 Electro-magnetic mooring; Harlan P. Wellman, Catlettsburg, Ky.

408,785 Electric gas lighter; Theo. J. Zoeller, Louisville, Ky.

408,809 Electrode for secondary batteries; A. V. Meserole, New York, N. Y., assignor of one-half to H. A. Wilson.

408,829 Electric stop motion for drawing frames; Victor I. Cumnock, Lowell, Mass.

408,855 Electric railway; William M. Schlesinger, Philadelphia, Pa.

408,875 Method of electric metal working; Mark W. Dewey, Syracuse, N. Y., assignor to the Dewey Corporation, same place.

408,887 Arc lamp; Jas. A. Lighthipe, Philadelphia, Pa.

408,910 Electro-dynamic machine; Geo. F. Card, Covington, Ky.

408,948 Electric arc lamp; William H. Barker, Lawrence, Kans.

408,986 Apparatus for filling secondary batteries; H. G. Morris and Pedro G. Salom, Philadelphia, Pa.

409,015 Electric welding; Chas. Coffin, Detroit, Mich.

409,104 Conduit electric railway; Byron Jennings, San Jose, Cal.

409,106 Electrode for secondary batteries; William P. Kookogey, Brooklyn, assignor to the Kookogey Electric Co., New York, N. Y.

409,135 Electrical resistance; Edw. M. Bantley, New York, N. Y.

409,146 Electric railroad signal; William F. Grassier, Williamsport, Pa., assignor of three-fourths to C. C. Gibson, W. G. Elliot and W. B. Updegraff, all of same place.

409,157 Harmonic telegraphy; Francis Van Rysselberghe, Brussels, Belgium, assignor to the Phono-Multiplex Telegraph Company, Baltimore City, Md.

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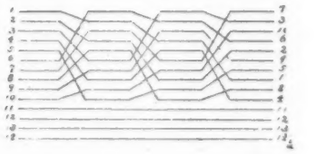

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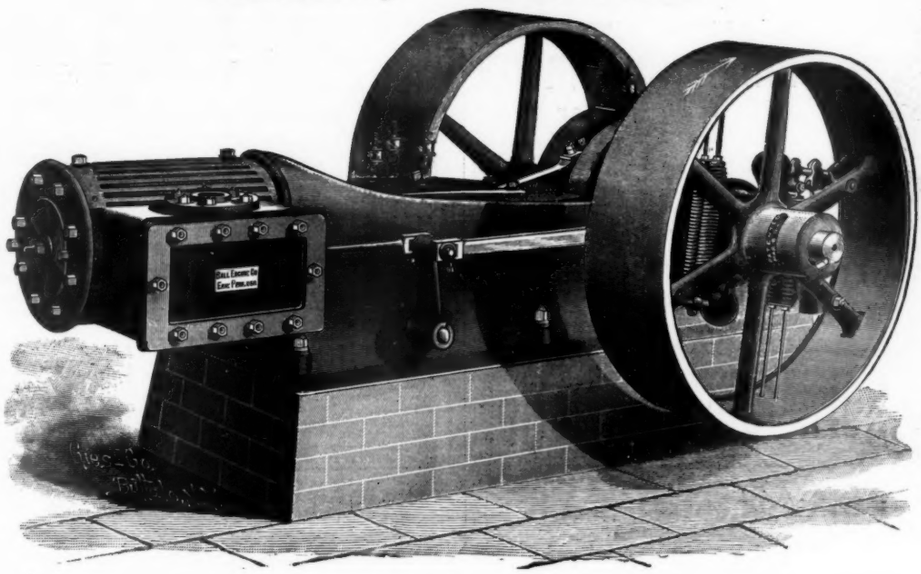

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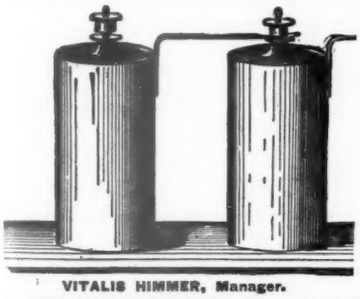

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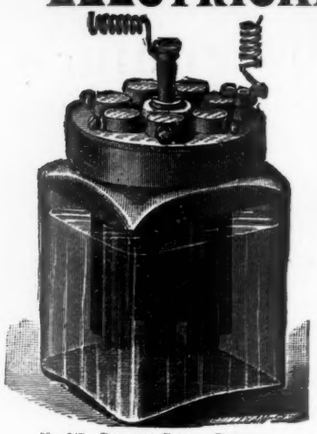

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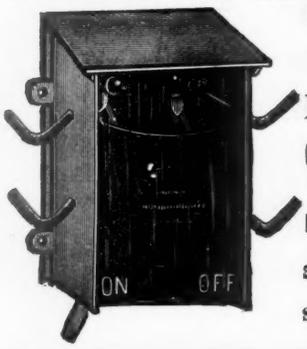

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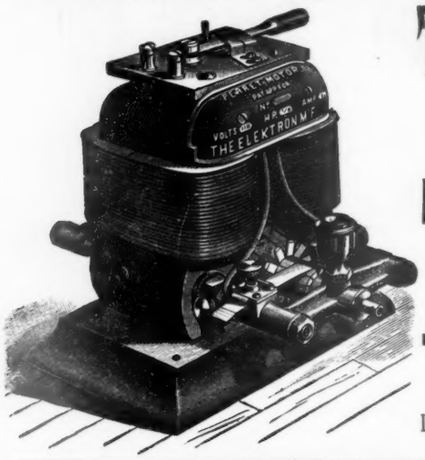

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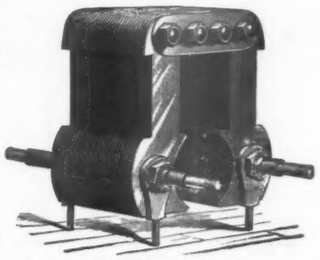

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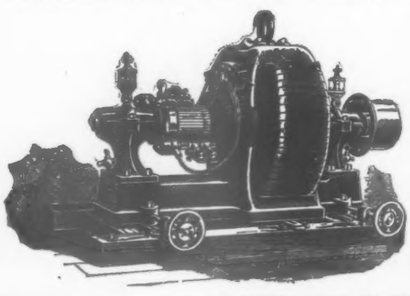

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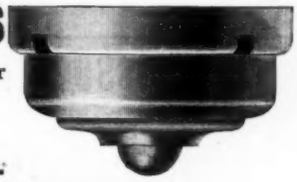

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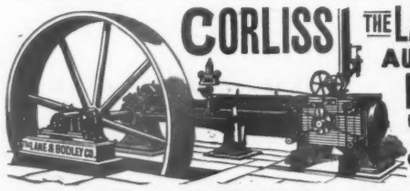

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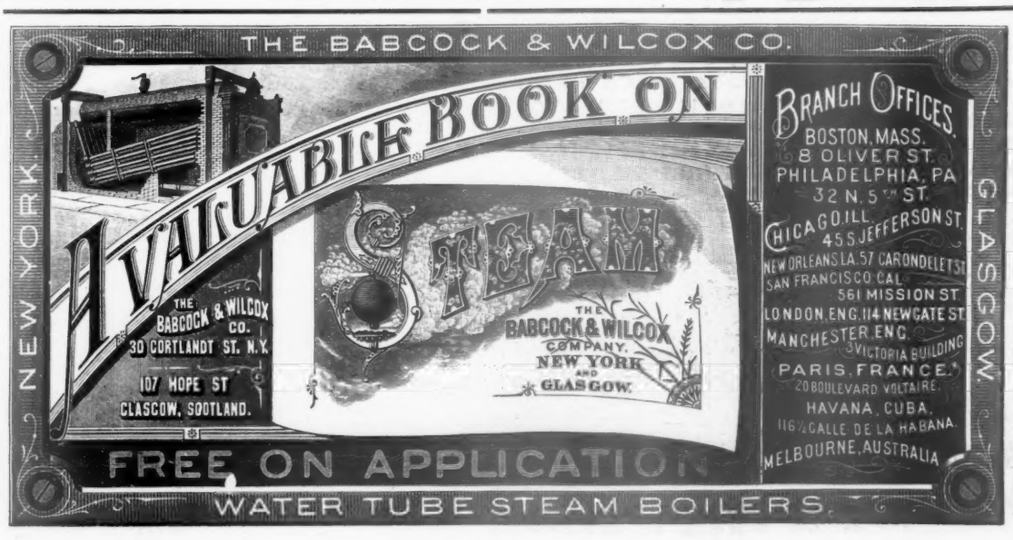
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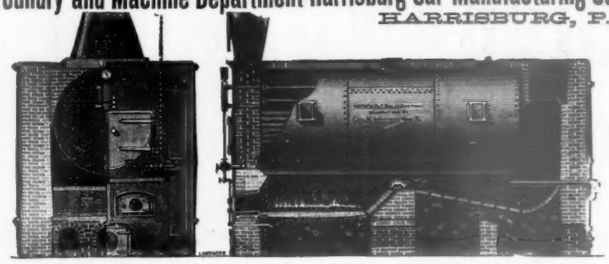

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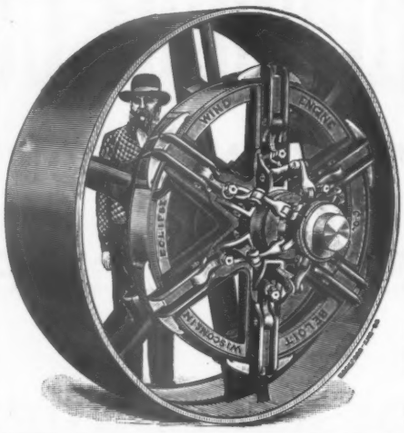

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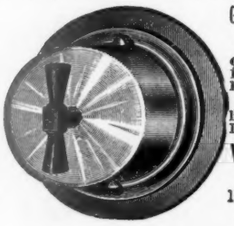

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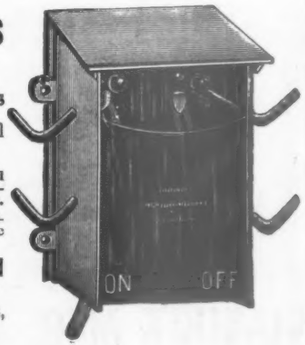

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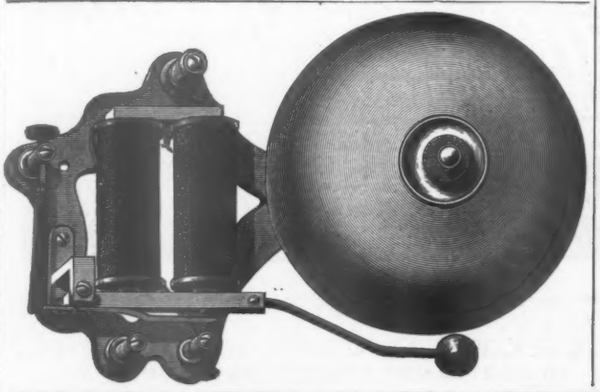

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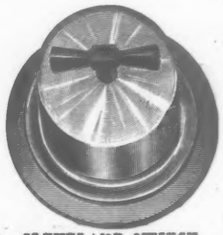
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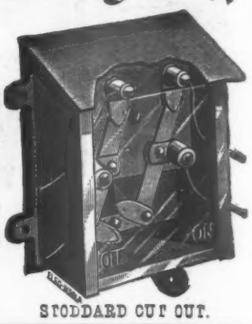

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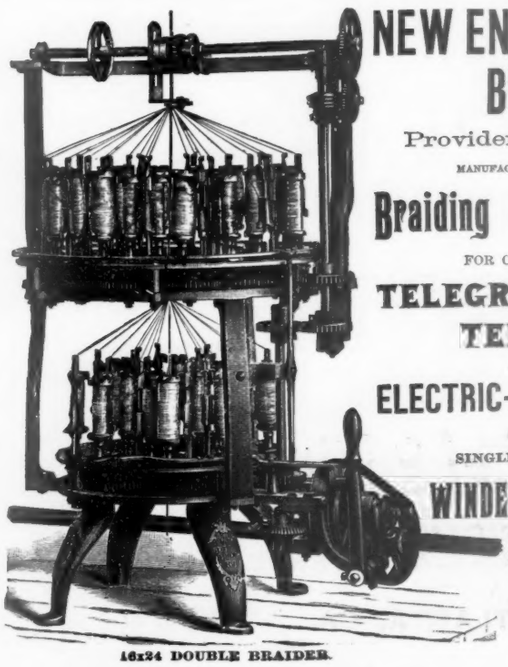
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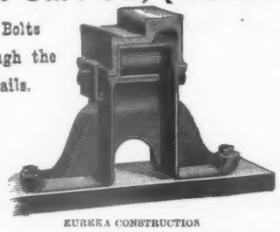
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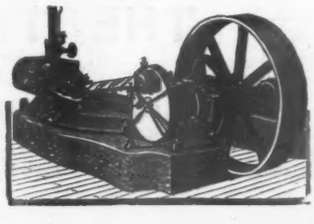

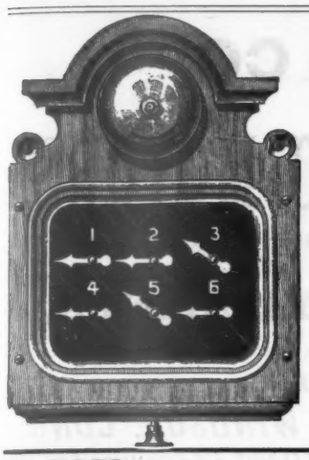

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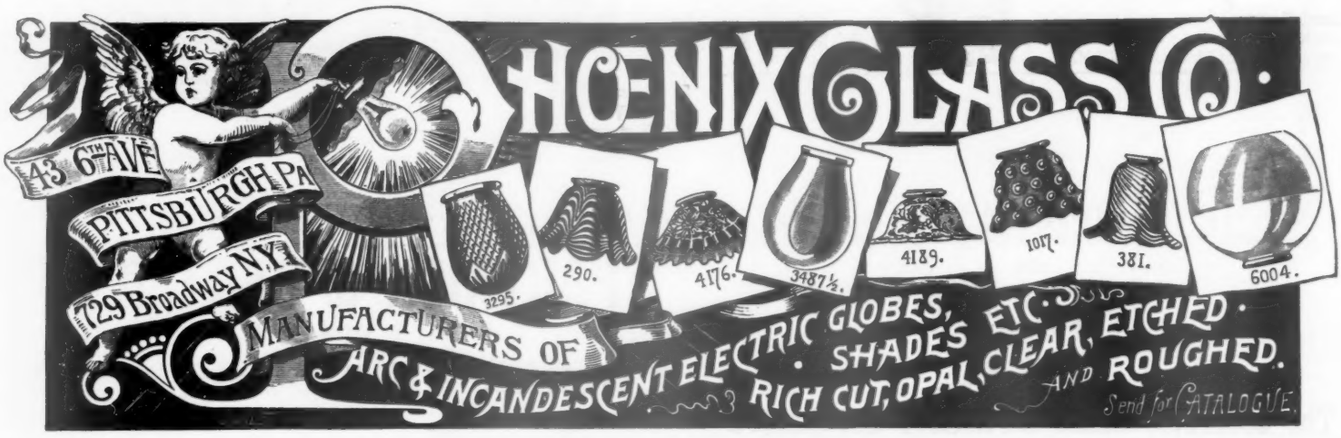

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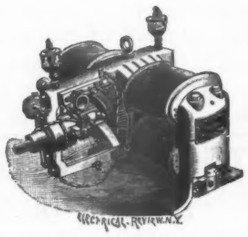

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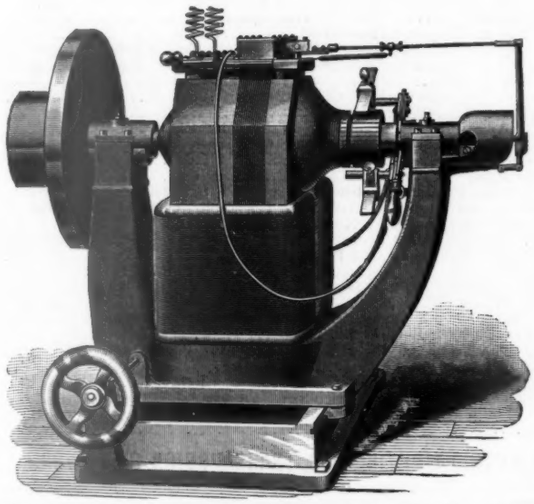

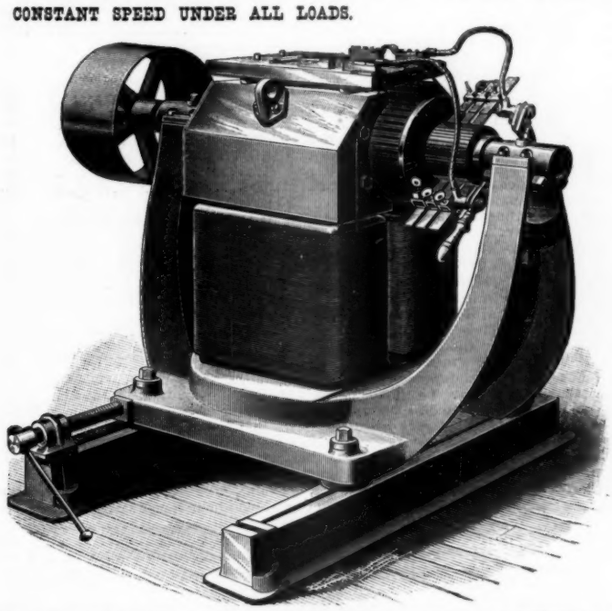

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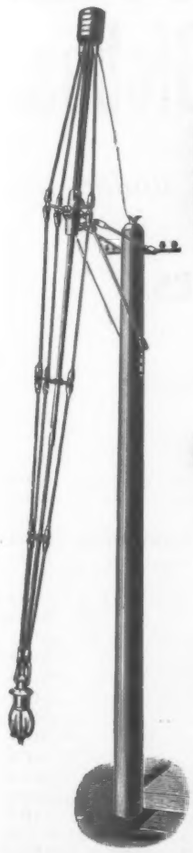

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